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OCTOBER 1984

INITIAL ASSESSMENT STUDY OF HUNTERS POINT NAVAL SHIPYARD (DISESTABLISHED) SAN FRANCISCO, CALIFORNIA

NEESA 13-059

NAVAL ENERGY AND ENVIRONMENTAL SUPPORT ACTIVITY

Port Hueneme, California 93043

INITIAL ASSESSMENT STUDY

HUNTERS POINT NAVAL SHIPYARD (DISESTABLISHED)

SAN FRANCISCO, CALIFORNIA

UIC: N62798

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EXECUTIVE SUMMARY

This report presents the findings and conclusions of the initial assessment study (IAS) conducted at Hunters Point Naval Shipyard (Disestablished) San Francisco, California. The purpose of an IAS is to identify and assess sites posing a potential threat to human health or to the environment due to contamination from past hazardous material operations.

Hunters Point Naval Shipyard (HPNS) was disestablished in June 1974. The property then became formally known as Hunters Point Naval Shipyard (Disestablished). In 1976, most of the Navy-owned property at Hunters Point was leased to Triple A Machine Shop, Incorporated, which currently operates the facility as a commercial shipyard. Supervisor of Shipbuilding, Conversion and Repair (SUPSHIP), San Francisco, occupies the Navy-retained portion of the property and acts as the lease administrator.

The IAS team determined that 12 sites exist at HPNS where hazardous wastes were disposed of or spilled. This determination was based on information from historical records, aerial photographs, field surveys, and personnel interviews. Each site was assessed with regard to contamination characteristics, migration pathways, and pollutant receptors. The IAS team concluded that six (6) of the 12 sites identified pose a potential threat to human health or the environment and warrant Confirmation Studies. A Confirmation Study involves the sampling and monitoring of a site in order to confirm the presence of contamination and the quantity and migration pathways of the contaminants. The sites recommended for Confirmation Studies are:

- Site 1, Oil Reclamation Ponds
- Site 3, Industrial Landfill
- Site 5, Scrap Yard
- Site 6, Old Transformer Storage Yard
- Site 9, Bay Fill Area
- Site 11, Battery and Electroplating Shop

The results of the Confirmation Studies will be used to evaluate the need for conducting remedial measures or cleanup operations. Those sites for which Confirmation Studies are not warranted but for which further corrective action is recommended, are listed below:

- Site 4, Abandoned 55-Gallon Drums
- Site 7, Building 521 - Power Plant
- Site 8, Pickling and Plate Yard

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FOREWORD

The Department of the Navy developed the Navy Assessment and Control of Installation Pollutants (NACIP) Program to identify and control environmental contamination from past use and disposal of hazardous substances at Navy and Marine Corps installations. The NACIP program is part of the Department of Defense Installation Restoration Program, and is similar to the Environmental Protection Agency's "Superfund" program authorized by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980.

In the first phase of the NACIP program, a team of engineers and scientists conducts an Initial Assessment Study (IAS). The IAS team collects and evaluates evidence of contamination that may pose a potential threat to human health or to the environment. The IAS includes a review of archival and activity records, interviews with activity personnel, and conducts an onsite survey of the activity. This report documents the findings of an IAS at the Hunters Point Naval Shipyard (Disestablished) HPNS , San Francisco, California, which is currently administrated by Supervisor of Shipbuilding, Conversion and Repair (SUPSHIP) San Francisco.

Confirmation Studies under the NACIP program were recommended for six sites at HPNS. Western Division, Naval Facilities Engineering Command (WESTNAVFACENGCOM), will assist SUPSHIP San Francisco in implementing the recommendations.

Questions regarding this report should be referred to the Naval Energy and Environmental Support Activity, 112N, at AUTOVON 360-3351, FTS 799-3351, or commercial (805) 982-3351. Questions concerning confirmation work or other follow-on efforts should be referred to WESTNAVFACENGCOM, 114, at AUTOVON 859-7497, FTS 448-7497, or commercial (415) 877-7497.

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- Captain Coleman, Commanding Officer, SUPSHIP
- Fred Stivender, SUPSHIP
- Alex Dong, WESTNAVFACENGCOM
- Pam Clements, OESO
- John Edkins, Project Manager, NAVENENVSA

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CHAPTER 1. INTRODUCTION

1.1 PROGRAM BACKGROUND. Past hazardous waste disposal methods, although acceptable at the time, have often caused unexpected long-term problems through release of hazardous pollutants into the soil and ground water. In response to increasing national concern regarding these problems, Congress directed the Environmental Protection Agency (EPA) to develop a comprehensive national program to manage past disposal sites. The program is outlined in the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of December 1980.

1.1.1 Department of Defense Program. Department of Defense (DOD) efforts in this area preceded the nationwide CERCLA program. In 1975, the U.S. Army developed for DOD a pilot program to investigate past disposal sites at military installations. DOD defined the program as the Installation Restoration Program in 1980 and instructed the services to comply with program guidelines.

1.1.2 Navy Program. The Navy manages its part of the program, the Navy Assessment and Control of Installation Pollutants (NACIP) Program, in three phases. Phase 1, the Initial Assessment Study (IAS), identifies disposal sites and contaminated areas caused by past hazardous substance storage, handling, or disposal practices at naval activities. These sites are then individually evaluated with respect to their potential threat to human health or to the environment. Phase 2, the Confirmation Study, verifies or characterizes the extent of contamination present and provides additional information about migration pathways. Phase 3, Remedial Action, provides the required corrective measures to mitigate or eliminate confirmed problems.

1.2 AUTHORITY. The Chief of Naval Operations (CNO) initiated the NACIP Program in OPNAVNOTE 6240 of 11 September 1980, superseded by OPNAVINST 5090.1 of 26 May 1983. The Naval Facilities Engineering Command (NAVFACENGCOM) manages the program within the existing structure of the Naval Environmental Protection Support Service (NEPSS), which is administered by the Naval Energy and Environmental Support Activity (NAVENENVSA). NAVENENVSA conducts the program's Phase 1 IAS in coordination with NAVFACENGCOM Engineering Field Divisions (EFDs). Activities are selected for an IAS by CNO, based on recommendations by NAVFACENGCOM, the regional EFDs, and NAVENENVSA. Approval of Hunters Point Naval Shipyard (Disestablished), San Francisco, California, for an Initial Assessment Study is given in CNO letter serial 451/3U392444 of 5 July 1983.

1.3 SCOPE.

1.3.1 Past Operations. The NACIP Program focuses attention on past hazardous substance storage, use, and disposal practices on Navy property. Current practices are regularly surveyed for conformity to state and federal regulations, and therefore, are not included in the scope of the NACIP Program. The IAS report addresses operational non-hazardous waste disposal and storage areas only if they were hazardous waste disposal or storage areas in the past. Current operations are investigated solely to determine what types and quantities of materials were used, and what disposal methods were practiced.

1.3.2 Results. If necessary, an IAS recommends mitigating actions to be performed by the activity or EFD, or recommends Confirmation Studies to be administered by the EFD under the NACIP Program. Based on these recommendations, NAVFACENGCOM schedules Confirmation Studies for those sites determined by scientific and engineering judgment to pose a potential threat to human health or to the environment.

1.4 INITIAL ASSESSMENT STUDY.

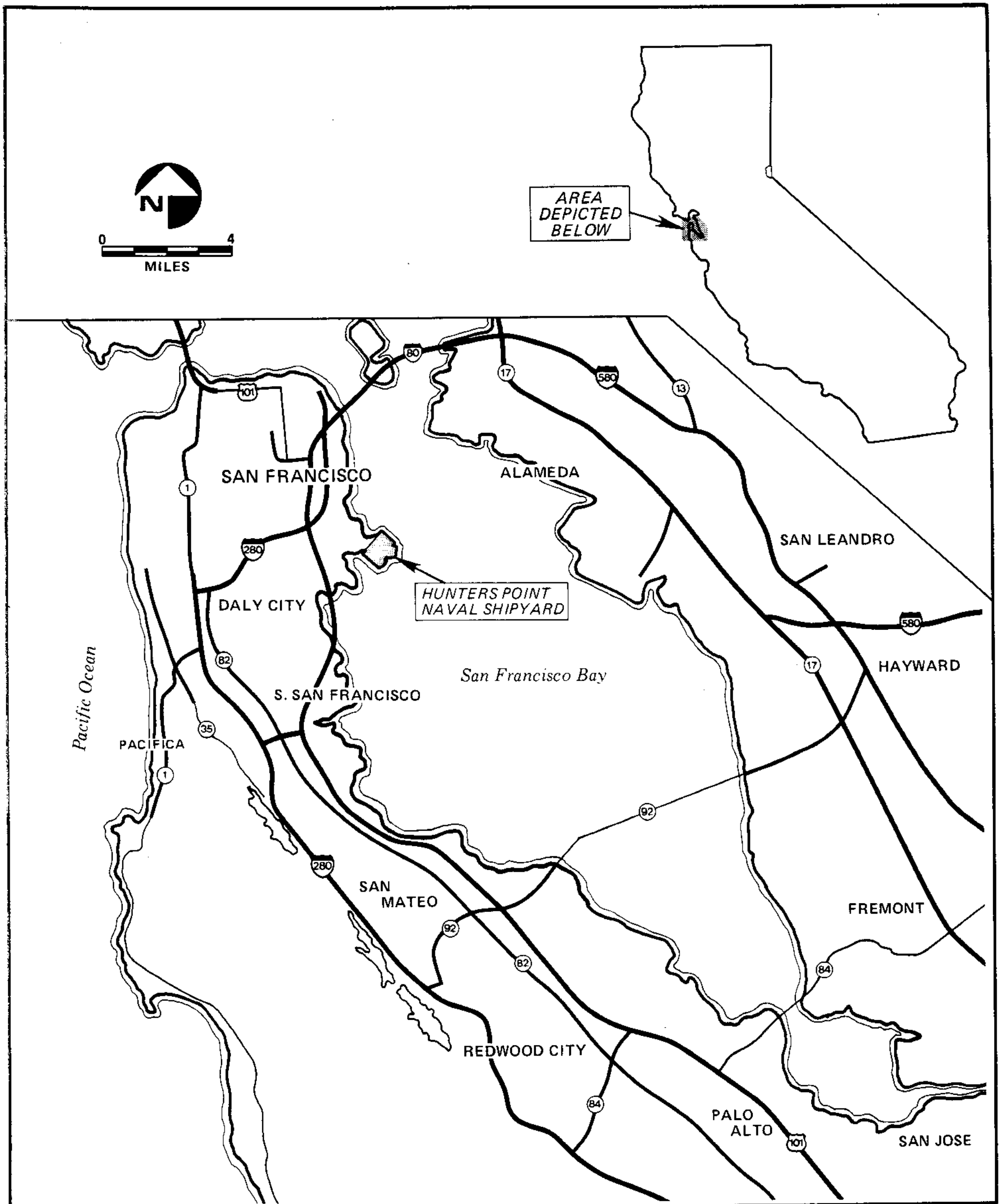
1.4.1 Records Searches. The IAS begins with records searches at various government agencies; including the EFDs, the national and regional archives and record centers, and U.S. Geological Survey offices. In this integral step, study team members review records to assimilate information about the activity's past missions, industrial processes, waste disposal records, and known environmental contamination. Examples of records researched include activity master plans and histories, environmental impact statements, cadastral records, and aerial photographs. Appendix A lists the agencies contacted during this study.

1.4.2 On-Site Survey. After the records searches, the study team conducts an on-site survey to complete documentation of past and present operations and past disposal practices and to identify potentially contaminated areas. With the assistance of an activity point of contact, the team inspects the activity during ground and aerial tours, and interviews long-term employees and retirees. The on-site survey for Hunters Point Naval Shipyard (Disestablished) [HPNS], San Francisco was conducted from 13-17 February 1984; report information is current as of those dates. A location map that shows the HPNS regional area is presented in Figure 1-1.

Information obtained from interviews is verified by data from other sources or corroborating interviews before inclusion in the report. If information for certain sites is conflicting or inadequate, the team may collect samples for clarification.

1.4.3 Confirmation Study Ranking System. With information collected during the study, IAS team members evaluate each site for its potential hazard to human health or to the environment. A two-step Confirmation Study Ranking System (CSRS), developed at NAVENENVSA, is used to systematically evaluate the relative severity of potential problems. The two steps of the CSRS are a flowchart and a numerical ranking model. In the first step, a flowchart eliminates innocuous sites from further consideration. The flowchart is based on type of waste, type of containment, and hydrogeology. If the flowchart indicates that a site poses a potential threat to human health or to the environment, the ranking model is applied. The model assigns a numerical score from 0 to 100 to each site. The score reflects the characteristics of the wastes, the potential migration pathways from the site, and possible contaminant receptors on and off the activity.

1.4.4 Site Ranking. After scoring a site, engineering judgment is applied to determine the need for a Confirmation Study or a mitigating action. At sites recommended for further work, CSRS scores are used to rank the sites in a prioritized list for scheduling projects. For a more detailed description, refer to NAVENENVSA Confirmation Study Ranking System (NEESA 20.2-042).



INITIAL ASSESSMENT STUDY HPNS, SAN FRANCISCO	Regional Setting	FIGURE 1-1

1.4.5 <u>Confirmation Study Criteria</u>. A Confirmation Study is recommended for sites at which (1) sufficient evidence exists to indicate the presence of contamination, and (2) the contamination poses a potential threat to human health or to the environment.

1.5 CONFIRMATION STUDY. Generally, the EFD conducts the Confirmation Study in two phases--verification and characterization. In the verification phase, short-term analytical testing and monitoring determines whether specific toxic and hazardous materials, identified in the IAS, are present in concentrations considered to be hazardous. If required, a characterization phase, using longer-term testing and monitoring, provides more detailed information concerning the horizontal and vertical distribution of contamination migrating from sites, as well as site hydrogeology. If sites require remedial actions or additional monitoring programs, the Confirmation Study recommendations include the necessary planning information for the work, such as design parameters.

1.6 IAS REPORT CONTENTS. In this report, the significant findings, conclusions, and recommendations from the IAS are presented in Chapters 2 and 3. Chapter 4 describes general activity information, history, physical features, and biology. Chapters 5 through 8 trace the use of chemicals and hazardous materials, from storage and transfer, through manufacturing and operations, to waste processing and disposal. The later chapters provide detailed documentation to support the findings and conclusions in Chapter 2.

CHAPTER 2. SIGNIFICANT FINDINGS AND CONCLUSIONS

2.1 INTRODUCTION. This chapter summarizes the significant findings and conclusions made by the Initial Assessment Study (IAS) team for Hunters Point Naval Shipyard (Disestablished) [HPNS]. Twelve (12) past disposal sites are identified in this IAS report. The location of these sites are shown in Figure 2-1. The IAS team has determined that six (6) sites pose a potential threat to human health or to the environment and warrant confirmation study. The confirmation study recommendations are discussed in Chapter 3.

In the first part of this chapter, the migration potential of contaminants and potential contaminant receptors are discussed. The remainder of this chapter briefly describes each site and summarizes the findings and conclusions which support or refute the existence of contamination and the potential threat to human health or to the environment.

2.1.1 Hydrogeology and Migration Potential. This section presents a summary of the hydrogeologic conditions and migration potential at HPNS. Migration potential is related to the waste characteristics of the disposal sites, the soils, and the ground water system in the vicinity of the sites.

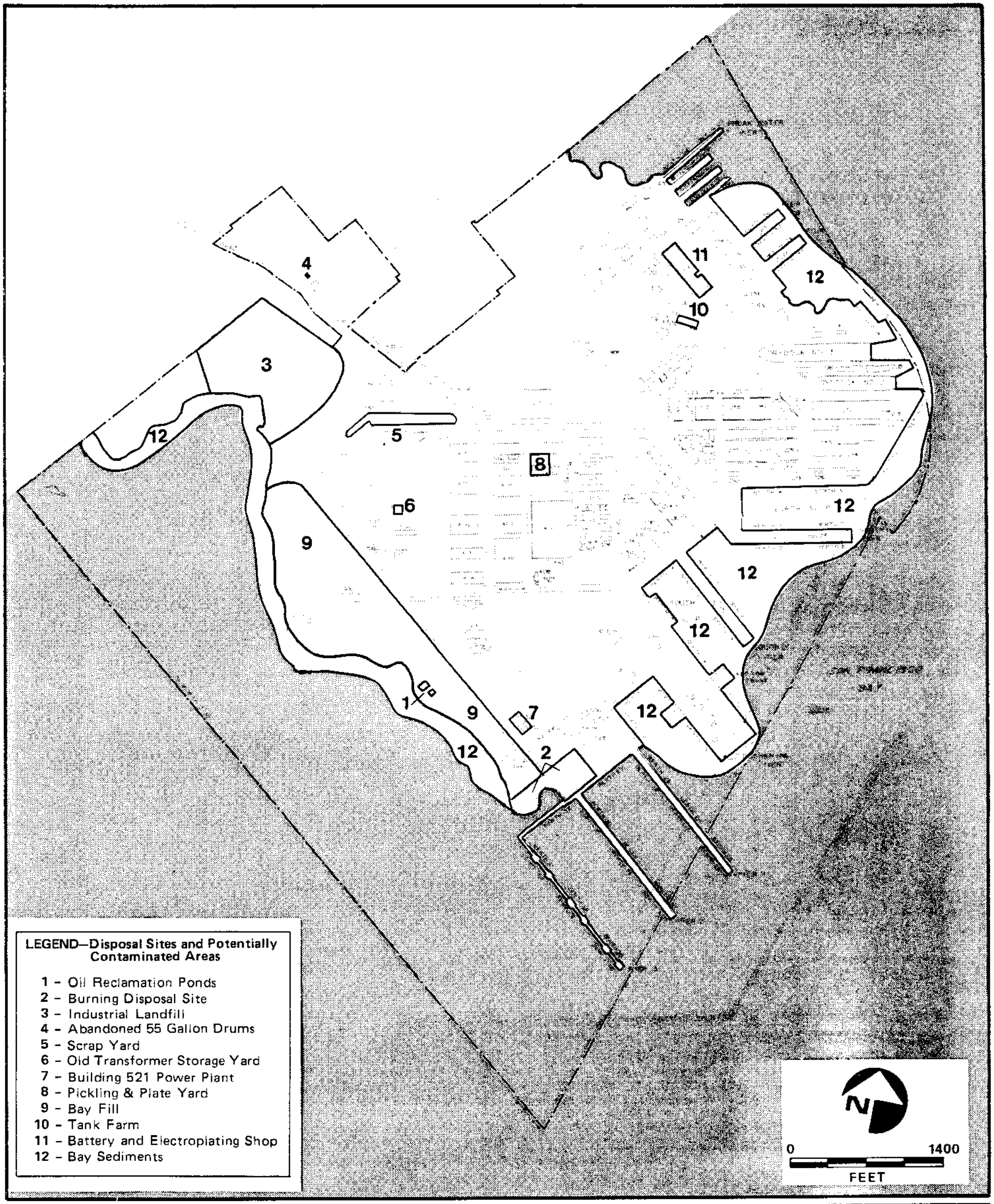
HPNS is located in the San Francisco Bay Area on the east side of the San Francisco Peninsula. The area is underlain by rocks which range in age from Jurassic-cretaceous to recent. The key formations relative to the migration of contaminants consist of the Franciscan Group, San Francisco Bay Mud, and artificial fill. Ground water flows through the fractured bedrock aquifers, the unconsolidated formations, and the fill.

In general, ground water flows from the highland areas, a regional recharge area, to the bay area, a region discharge area. Therefore, potential mobile contaminants that enter the flow system within the shipyard area will flow towards the bay and, if mobile enough, will eventually discharge to the bay. It has been estimated that the velocity of contaminant migration is about 15 feet per year.

Potable water for HPNS is supplied by the City of San Francisco. There are no operational wells within 1 mile of HPNS. However, there is a spring located within 1 mile of HPNS, which is used for bottling water by Mountain Spring Water Company. The spring is upgradient from HPNS sites and therefore is not threatened by site contaminant migration (see Figure 2-1).

2.1.2 Potential Contaminant Receptors. There are no potable water wells that would be affected by contaminant migration from HPNS. Ground water at HPNS is shallow, from just below land surface to 10 feet deep. Ground water underlying HPNS flows toward the Bay. All surface water runoff, that is not collected by the storm water sewer system, drains naturally towards the Bay.

The potential contaminant receptors at HPNS are the marine life in San Francisco Bay and humans that would come into direct contact with contaminated land surfaces. As described in Section 4.2, Biological Resources of this report,



INITIAL ASSESSMENT STUDY
HPNS, SAN FRANCISCO

Disposal Site Location Map

FIGURE 2-1

there are no endangered marine fish or invertebrate species in the Bay surrounding HPNS. However, the Bay marine habitat in the nearshore area of HPNS is used for recreational and (limited) commercial fishing.

2.2 DISPOSAL SITES AND POTENTIALLY CONTAMINATED AREAS.

2.2.1 Site 1, Oil Reclamation Ponds. From 1944 to 1974 HPNS operated a waste oil reclamation system which used two man-made unlined ponds for oil storage. The ponds were located on the southwest side of the shipyard 10 meters from the shore on bayfill. Oil wastes were generated from ships and industrial shops. The amount of waste oil reclaimed at the ponds varied from 0.5 to 2.0 million gallons per year. The ponds were periodically emptied by a contractor who bought the oil and transported it offsite. This IAS determined that chemicals such as trichloroethylene (solvents), caustic sodas, ethylene glycol and chromates were also disposed of in these ponds. The amount of liquid chemicals disposed of could not be determined.

In 1974 the ponds were emptied and filled with soil. No additional remedial or cleanup action was undertaken. Based on evidence gathered in this IAS, waste oils, solvents, and chemicals still exist in the soils underlying the pond site. Therefore IAS team has concluded that there is a high potential for contaminants to reach the ground water and to migrate to the Bay. This migration would constitute a threat to the Bay environment. A confirmation study is recommended for this site.

2.2.2 Site 2, Burning Disposal Site. From 1945 to 1948 the shipyard operated an open, burning disposal site for garbage and refuse-type wastes. This 1-acre site was closed in 1948 because odor and smoke impacted an adjacent Navy housing complex. Volumes of waste delivered to this site were estimated at 20 to 40 tons per day. Total wastes disposed of amounted to 23,000 tons over a 3-year period. Burning of trash was conducted daily, thus significantly reducing the volume of solid waste in the site. The IAS team found no evidence which would indicate that hazardous or liquid wastes were disposed of in this site.

Because of the lack of contamination from this site, the IAS team has concluded that this site does not pose a potential threat to human health or the environment. It is recommended that no confirmation study be conducted for the site, and that no further action is warranted.

2.2.3 Site 3, Industrial Landfill. From 1958 to 1974, the shipyard disposed of industrial and solid wastes along the west shore of the shipyard. Wastes included domestic waste and refuse, building construction and demolition wastes, dredge spoil materials, sand blast waste, shop industrial and chemical and solvent wastes, ship solid and liquid wastes from repair activities, and low-level radioactive wastes (from shipboard radium dials and electronics equipment). The IAS team estimates that over 1 million cubic yards of solid waste, 21,000 gallons of liquid chemical wastes, 500 cubic yards of asbestos, and 6000 pounds of fluorescent radium dials and knobs from ships, were disposed of over the 16 years the landfill was open. Over a 16-year period approximately 20 acres of Bay was filled by this operation. The landfill site was closed, covered with fill material and landscaped (with natural grasses) in 1975. The water table in this area is about 6 feet below land surface.

Soon after the closure of the landfill, leachate was observed flowing from the landfill to the bay. In 1975 an HPNS construction project (Project P-262) attempted to construct a slurry wall to seal the landfill and prevent leachate from reaching the Bay. The attempted slurry wall did not work because buried solid waste debris (concrete, wood, etc.) prevented excavation and construction in the landfill. It is highly probable that toxic, hazardous and radiological wastes in the landfill have reached the ground water and are now migrating into the Bay. This contaminant migration presents a potential threat to the environment of the Bay. The IAS team recommends that a confirmation study be performed for this site.

2.2.4 Site 4, Abandoned 55-Gallon Drums. Since 1977, seven (7) chemical drums have been abandoned behind Building 816. One of the drums is labeled Styrene and another Pine Tar. All others are unlabeled. Visual inspection of the site showed evidence of spills from the drums. Assuming all drums were full when abandoned, the amount of spilled material is estimated at 40 gallons.

Because of the relatively small size of the spill area and the distance to the Bay (1 mile), no confirmation study work is required. The IAS recommends that the drums be removed by a licensed waste disposal contractor. Prior to removing the drums, samples should be taken to determine the presence of hazardous material in the drums. This information should be used to determine if soil contamination has occurred and if remedial action to remove any soil is needed.

2.2.5 Site 5, Scrap Yard. From 1954 to 1974, the HPNS scrap yard stored significant quantities of used submarine battery lead and copper, along with used electrical capacitors. Handling, crushing, and storage of these wastes at this yard resulted in lead and copper residues entering the unpaved soil. PCBs from crushed capacitors also spilled onto the ground.

Over the 30 year period, an estimated 42 million pounds of lead and 7 million pounds of copper were stored at the yard. It was estimated that approximately 7000 pounds of lead and copper residue were rain washed onto the soil at the scrap yard. An estimated 250 gallons of PCBs from crushed capacitors may have been spilled on site over a 20-year period.

Both the metal residues and PCB oils are not mobile in the soil and would not reach the ground water. It is, however, highly probable that these contaminants are still present in the soil. This soil could pose a potential health threat to humans if they were to come into direct contact with the contaminated soil areas. Surface water runoff would also have the potential to carry soil contaminants to the Bay. The IAS team recommends that a confirmation study be conducted for this site.

2.2.6 Site 6, Old Transformer Storage Yard. From 1946 to 1974, used electrical transformers of various sizes were stored in a open yard 400 feet north of Building 704. The site was and still is unpaved. The number of transformers stored or the length of time each was stored at this site could not be determined from historical records or interviews. (Currently the base uses a different area to store six to eight used transformers all of which contain PCB.) Transformers were periodically hauled offsite by a contractor. Although there is no record or reports of transformer oil spills, it can be assumed that some old transformers did leak oils and/or were emptied onsite resulting in contamination.

The possibility of PCBs being contained in the transformer oils is high. However, actual PCB spills at this site could not be documented. In the opinion of the IAS team, the potential for PCB contaminated soil is high. Although PCBs do not migrate in the soil, this situation could pose a potential threat to human health if direct contact with the soil were made. The IAS team recommends a confirmation study for this site.

2.2.7 Site 7, Building 521 - Power Plant. A high-pressure boiler power plant in Building 521 operated from 1950 to 1969. Since its shutdown, deterioration of the facility has resulted in an accumulation of waste asbestos, battery acids and chemical containers. The soil surrounding Building 521 is unpaved.

Outside the building, an estimated 400-500 pounds of asbestos lay exposed to the atmosphere. Fifteen 5-gallon containers are also abandoned outside which are labeled as xylene, metal conditioner, and paints.

Because the plant is closed there is no immediate threat to human health. The IAS team recommends a clean up and removal program for the asbestos and chemical containers. However, a confirmation study is not recommended.

2.2.8 Site 8, Pickling and Plate Yard. From 1947 to 1973, the area next to Building 411 was used as a steel pickling yard. Three empty acid storage tanks, three empty open (brick-lined) pits for dipping large steel plates and an open steel plate storage rack area characterize this site. This open rack area was mostly used to spray steel plates with zinc chromate primer.

Chemicals used at this site included zinc chromate, sulfuric acids, sodium dichromates and phosphoric acids. Approximately 15,000 gallons a month of acid-contaminated rinse water was discharged into the combined storm and sanitary sewer system. Acid and zinc chromate residues from 25 years of painting operations coat most structures in this open pickling yard.

The IAS team determined that the concrete paved yard and the drains which now discharge into the (separate) sanitary sewer system prevent contaminants from presently reaching the ground water or the Bay. The site does not pose an immediate threat to human health or the environment. However, the team does recommend a clean-up program of the zinc chromate residue. A confirmation study is not recommended for this site.

2.2.9 Site 9, Bay Fill. From 1945 to 1978, the Bay shore area on the southwest edge of the shipyard was a site for the disposal of sandblast waste. An estimated 237,500 tons of abrasive (sandblast) waste was disposed of along the south shore of the shipyard. Sandblast waste contains sand aggregate, steel, copper and lead grit, rust, paint (lead-based) scrapings and other debris from the ship hulls being sandblasted. Paint scrapings are estimated to make up about 6 percent of the abrasive waste volume. Marine paint used on older (pre-1978) ships contained lead, copper, and other heavy metals.

The potential for heavy metals, such as lead, copper, and other sandblast contaminants to enter the ground water system and then to migrate to the Bay is high. Therefore, a potential threat to the Bay environment exists. The IAS team recommends a confirmation study for this Bay fill site.

2.2.10 Site 10, Tank Farm. The diesel oil tank farm near Buildings 111 and 112 has been used since 1942 and is currently still in use. There is one 4384 barrel (55 gallon/barrel) tank and nine 286 barrel tanks storing diesel fuel on the site. The tank farm is a site of past oil spills. Reportedly, in 1944 a 286-barrel tank ruptured. Oil overflowed the tank farm berms and was cleaned up. Visual inspection of the area under the tanks shows evidence of past oil spills.

The IAS team determined that the protective berms surrounding the tank farm, the paved ground, and the underlying bedrock prevent the migration of oil offsite. The site does not pose a threat to human health or the environment. No confirmation study was recommended for this site.

2.2.11 Site 11, Battery and Electroplating Shop. Between 1944 and 1974, Building 123 operated as the submarine battery overhaul and storage shop as well as an electroplating shop. This building is currently used as a commercial warehouse. Waste acids contaminated with lead and copper spilled onto the shop floor almost continuously over the 30 years of operation. A total of 40 million pounds of lead was handled in this building and approximately 1.8 million gallons of spent acid was drained into floor drains. These liquid wastes were discharged to the storm sewer which discharged directly into the Bay. Approximately 250,000 gallons of spent electrolyte containing heavy metals, lead, tin, chromium, and copper were also discharged to the storm sewer by the plating shop in this building.

Contamination of the building floor with lead particulates poses a potential threat to the health of the present working population in the building. For this reason, the IAS team recommends a confirmation study for Site 11.

2.2.12 Site 12, Bay Sediments. From 1942 to 1977 the shipyard had a combined sanitary and storm sewer system. Industrial shop wastewater was discharged to this system and was pumped to the City and County of San Francisco's sewage collection system and treatment plant. However, in periods of high storm water runoff which occurred about 9-12 times annually, diversion structures would direct the flow directly to the Bay. Overflows were discharged near Berth 4, near Lockwood and Donohue Streets, near Berth 15, and southwest of Mahan and J Streets. In addition, from 1942 to about 1970 the battery and electroplating shop (Building 123) and the acid mixing plant (Building 124) discharged industrial waste water directly to the Bay via storm drains at an area near Berth 64. This drain carried about 12,000 gallons per day of water containing sulfuric acid, solvents, hexavalent chromium, copper, and lead from plating and battery overhaul operations, all of which was discharged to the Bay. Sandblasting operations in the dry dock area also discharged blasting grit, paint scrapings, metal rust to the Bay.

Considering the extensive amount of past industrial waste discharged to the Bay, the Bay sediment immediately surrounding the HPNS shore can be considered a past disposal site since it received the insoluble metals and particulates of the contaminated waste streams. The soluble portion was diluted in the Bay waters and carried away by tidal forces. Sediment samples taken in 1972 to support a shipyard dredging permit application show elevated chemical oxygen demand, lead, volatile solids, and zinc. 1971 sediment chemistry data also shows high copper levels. A 48 hour sediment bioassay conducted in 1971 did not, however, show significant mortality to fish.

Based on the above findings, the IAS team has concluded that the Bay bottom sediments found immediately below the shipyard shoreline is contaminated with heavy metals and other hazardous pollutants. Future dredging of this sediment area will require prior approval from the U.S. Army Corps of Engineers, the Bay Area Regional Water Quality Control Board and the California Department of Health Services. However, the IAS team does not recommend that a confirmation study for Bay sediment be conducted. This site which has been documented to have contaminated sediment is best left undisturbed. Therefore, no further action for this site is recommended.

CHAPTER 3. RECOMMENDATIONS

3.1 INTRODUCTION. This chapter presents recommendations for the 12 disposal sites identified at Hunters Point Naval Shipyard (Disestablished) HPNS , San Francisco. Six of the sites pose a potential threat to human health or the environment and are recommended for confirmation studies (Sites 1, 3, 5, 6, 9, 11). The Confirmation Study Ranking System (CSRS) is used to systematically evaluate the severity of potential problems at these sites. Three sites are listed as non-confirmation sites but recommendations are made for mitigation measures (Sites 4, 7, 8). Three sites have been identified that require no further action (Sites 2, 10, 12). Tables 3-1 and 3-2 summarize these recommendations.

The Confirmation Study recommendations in this chapter are designed to first verify the presence of contamination. Therefore, site-specific sampling programs are only recommended for a period of 1 year or less. Depending on the first year verification results, a further characterization of the extent of contamination at a given site may or may not be warranted. Design of site-specific characterization work will depend on the results of the first year verification step.

3.2 CONFIRMATION STUDIES. The IAS team concluded that confirmation studies are appropriate and warranted for HPNS sites 1, 3, 5, 6, 9 and 11. Sites 1, 3, 5, 6 and 9 are recommended because they present a potential for contaminants to migrate to San Francisco Bay. Site 11 is recommended because a potential exists for an occupational health problem due to exposure to air-borne particulates containing lead inside Building 123. A discussion of confirmation and non-confirmation recommendations for each site is presented below. Table 3-2 summarizes the confirmation recommendations.

For sites 1, 3, and 4 soil borings and monitoring wells are recommended. In general, the borings can be drilled with a hollow stem auger to a depth of about 20 feet or into the Bay Mud geologic unit, whichever is shallowest. Split spoon (or similar sampling device) samples should be collected every 5 feet. These samples should be described geologically and be sent to a qualified laboratory to analyze for key constituents at the specific site.

These borings can then be used to install monitoring wells. These wells should be properly constructed and developed according to EPA guidelines described in 40 CFR 264 Subpart F. The screened interval should be about 10 feet, starting in general, at a few feet above the water table. Sampling protocol should also be developed for each well and will depend on the constituents to be analyzed. If contamination is confirmed at the site, further testing may be needed to characterize the site and the extent of contamination before remedial action recommendations can be made.

Table 3-1

Summary of Site Recommendations

Site Number	Site Name	Recommendation
59-1	Oil Reclamation Ponds	Confirmation Study
59-2	Burning Disposal Site	No Further Action
59-3	Industrial Landfill	Confirmation Study
59-4	Abandoned 55-gallon Drums	Mitigating Action
59-5	Scrap Yard	Confirmation Study
59-6	Old Transformer Storage Yard	Confirmation Study
59-7	Building 521 - Power Plant	Mitigating Action
59-8	Pickling and Plate Yard	Mitigating Action
59-9	Bay Fill	Confirmation Study
59-10	Tank Farm	No Further Action
59-11	Battery and Electro-plating Shop	Confirmation Study
59-12	Bay Sediment	No Further Action

Table 3-2

Summary of Confirmation Study Site Recommendations

Site Number	Site Name	CSRS Score	Number of Wells	Number and Types of Samples (First Year)	Sampling Frequency	Parameters to be Analyzed
59-1	Oil Reclamation Ponds	13	4	16 Soil 16 water	Soil: once Water: quarterly	Soil: PIGWQ,[1] chromium Water: PIGWQ, Run EPA methods 624, 625, if TOX is present.[2] Water level and hydrocarbon thickness.
59-3	Industrial Landfill	24	9	36 soil 36 water	Soil: once Water: quarterly	Soil: IPDWS, PIGWQ, phenols Water: Priority pollutants for first quarter. From the above, the key constituents are determined and analyses are carried out on a quarterly basis.
59-5	Scrap Yard	11	–	8 soil 4 soil	Soil: once Water: once	Soil and Water: PCB, lead, copper, zinc and PIGWQ.
59-6	Old Transformer Storage Yard	9		20 soil samples	Soil: once	PCB
59-9	Bay Fill	20	4	16 soil 16 water	Soil: once Water: quarterly	Soil: PIGWQ, lead chromium, copper zinc, and tin Water: same as above and water levels.
59-11	Battery and Electroplating Shop	12	–	4 air samples 18 floor scrapings	Air: once Scrapings: 12 in battery shop and 6 in plating shop (once in first year)	Air samples in battery shop: lead, copper. Floor scrapings in plating shop: lead, chromium, copper, nickel, zinc.

[1]For definitions of acronyms see Table 3-3.

[2]It should be realized that 624 and 625 methods are for volatile and semi-volatiles and therefore holding times of storage methods are critical to results.

3.2.1 Site 1, Oil Reclamation Pond

• Type of Samples:	Ground Water Soil
• Number of Ground Water Monitoring Wells:	4 wells approximately 20 feet deep, 10 feet of casing/10 feet of screen
• Number of Soil Samples:	16 soil samples, 4 soil samples from each monitoring well boring
• Frequency of Sampling:	Soil: once Water: quarterly for 1 year
• Number of Samples:	Soil: 16 Water: 16
• Testing Parameters*	Soil: PIGWP, chromium Water: PIGWQ. Run EPA 624,625 if TOX is present** Water levels and hydrocarbon thickness
• Remarks:	Four wells, three down gradient and one upgradient of the site should be installed. Figure 3-1 provides a diagram of the suggested well locations.

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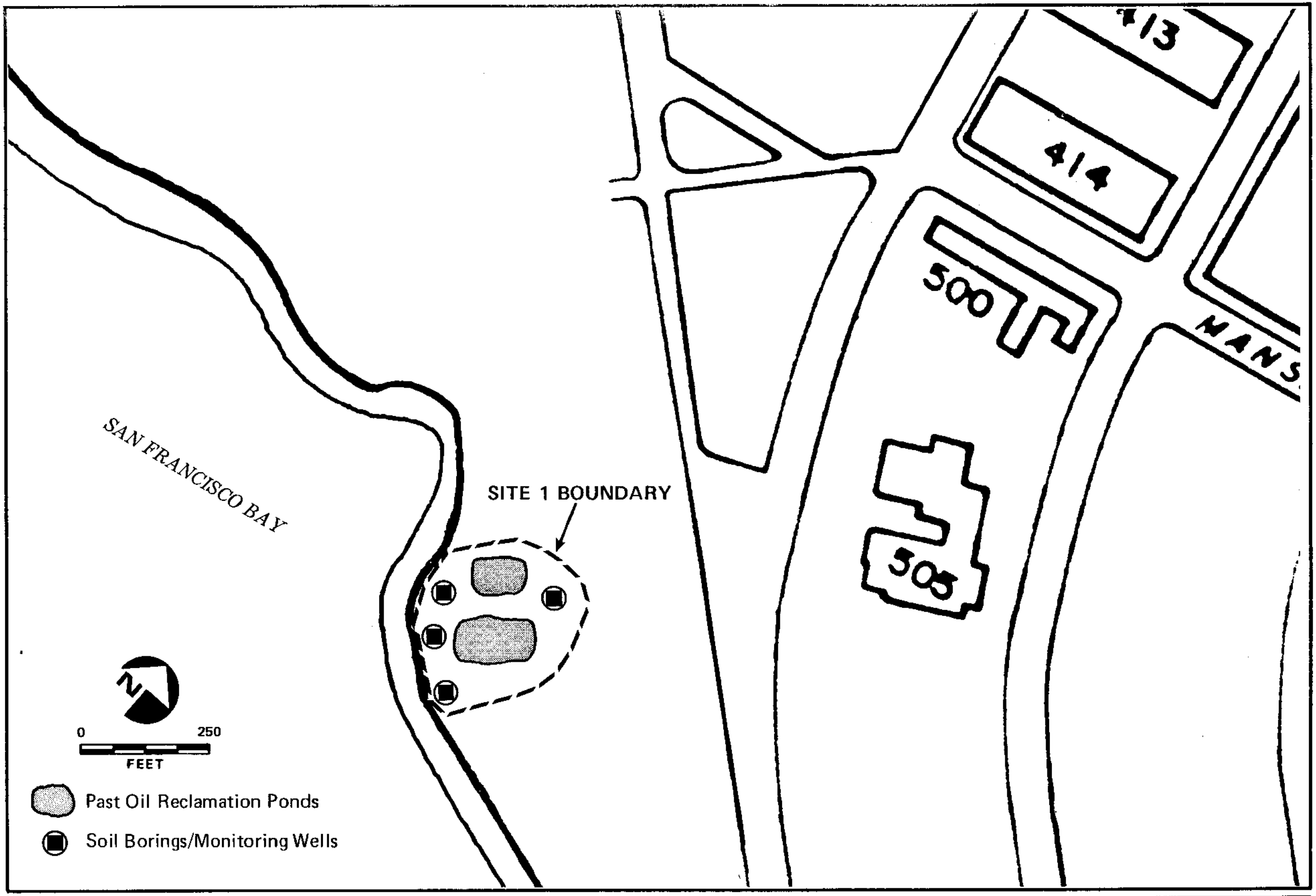
*See Table 3-3 for acronym definition.

**It should be realized that the 624 and 625 methods are for volatiles and semi-volatiles and therefore holding times and storage methods become critical to analytical results.



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HPNS, SAN FRANCISCO

Site 1, Oil Reclamation Ponds - Confirmation Study

FIGURE 3-1

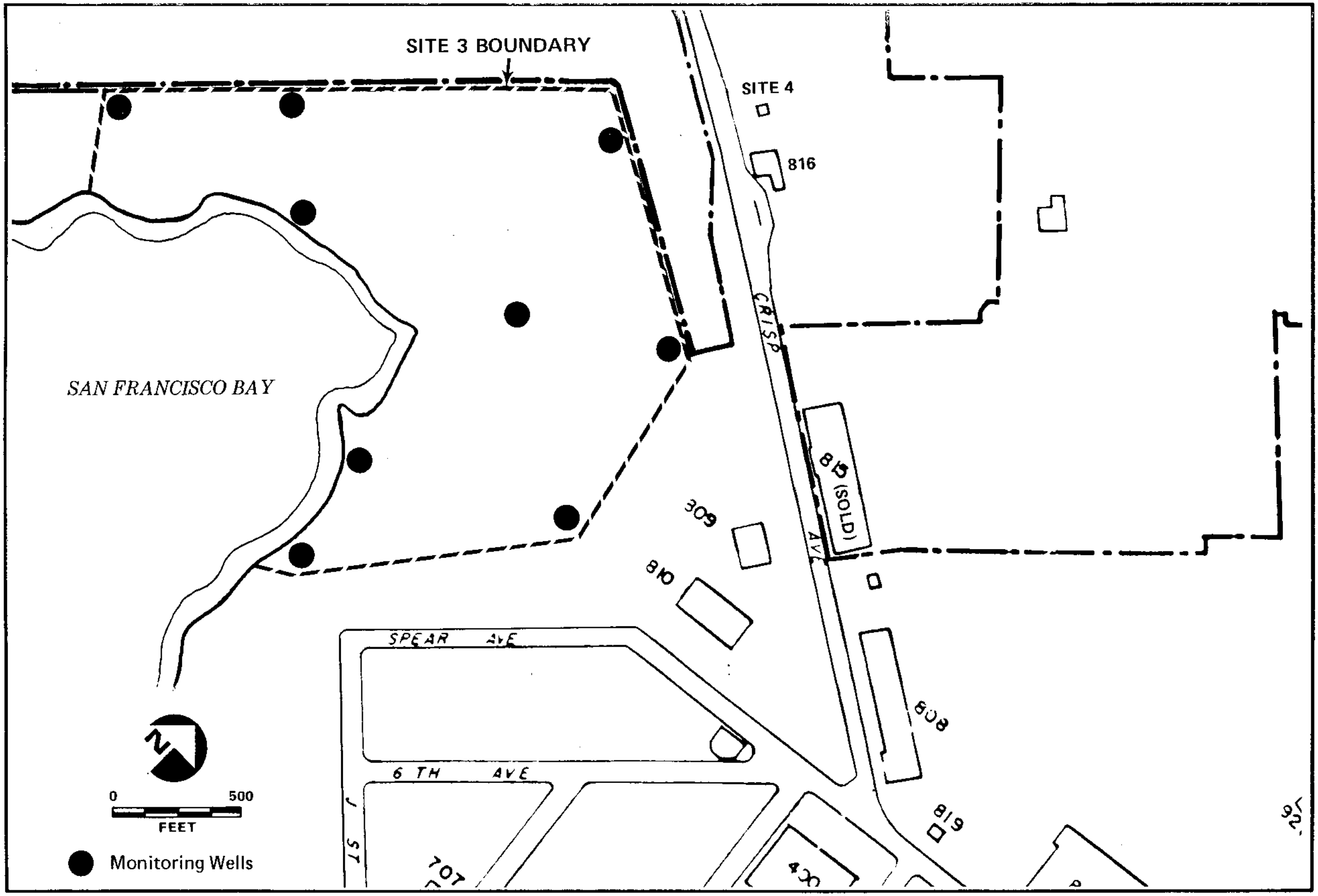
Table 3-3

Acronyms Used for Parameters to be Analyzed

Acronym	Name	Compounds
IPDWS	Interium Primary Drinking Water Standards	Enderin, Lindane, Methoxychlor, Toxaphine, 2,4 Dinitrotoluene, 2,4,5 Trichlorophenoxy, Radium, gross alpha and beta, Coliform, Arsenic, Barium, Cadmium, Chromium, Flourine, Lead, Mercury, Nitrate, Selenium, Silver
PIGWQ	Parameters Used as Indicators of Ground-water Quality	pH, Specific Conductance, Total Organic Carbon, Total Organic Halogen

3.2.2 Site 3, Industrial Land Fill

• Type of Samples:	Ground Water Soil
• Number of Ground Water Monitoring Wells:	9 wells approximately 20 feet deep, 10 feet of casing/10 feet of screen
• Number of Soil Samples:	36 soil samples; four soil samples from each monitoring well boring
• Frequency of Sampling:	Soil: once Water: quarterly for 1 year
• Number of Samples:	Soil: 36 Water: 36
• Testing Parameters:	Soil: IPDWS, PIGWQ, phenols Water: Priority pollutants for first quarter; quarterly basis: The key constitutents from 1st quarter analysis and/or IPDWS, PIGWQ, phenols and water levels.
• Remarks:	The nine wells located on Figure 3-2 are used to define and to confirm if contamination exists in different areas of the landfill. Figure 3-2 provides a diagram of the suggested well locations.



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Site 3, Industrial Landfill Confirmation Study

FIGURE 3-2

3.2.3 Site 5, Scrap Yard

• Type of Samples:	Soil
• Number of Ground Water Monitoring Wells	None
• Number of Soil Samples:	15 soil samples; 10 soil borings in scrap yard, 5 borings along track south of yard; all boring locations on a random sample grid. Two soil samples will be composited from each boring. These samples will be composited to represent depths of 0 to 1 and 3 to 4 feet below land surface.
• Frequency of Sampling:	Soil: once during the first year only
• Number of Samples:	Soil: 8
• Testing Parameters:	Soil: PCB, lead, copper, and zinc.
• Remarks:	Location of borings shown on Figure 3-3. This confirmation recommendation will determine if the contaminants are within the soil; are mobile enough to reach the ground water, and to determine if contaminants have already reached ground water. Depending on results of the initial testing and verification, additional soil borings may be needed to further characterize the soils at the scrap yard. Also, soil sampling at greater depths and filter-press water samples may be warranted if contaminants are verified in the 3 to 4 foot sample intervals.

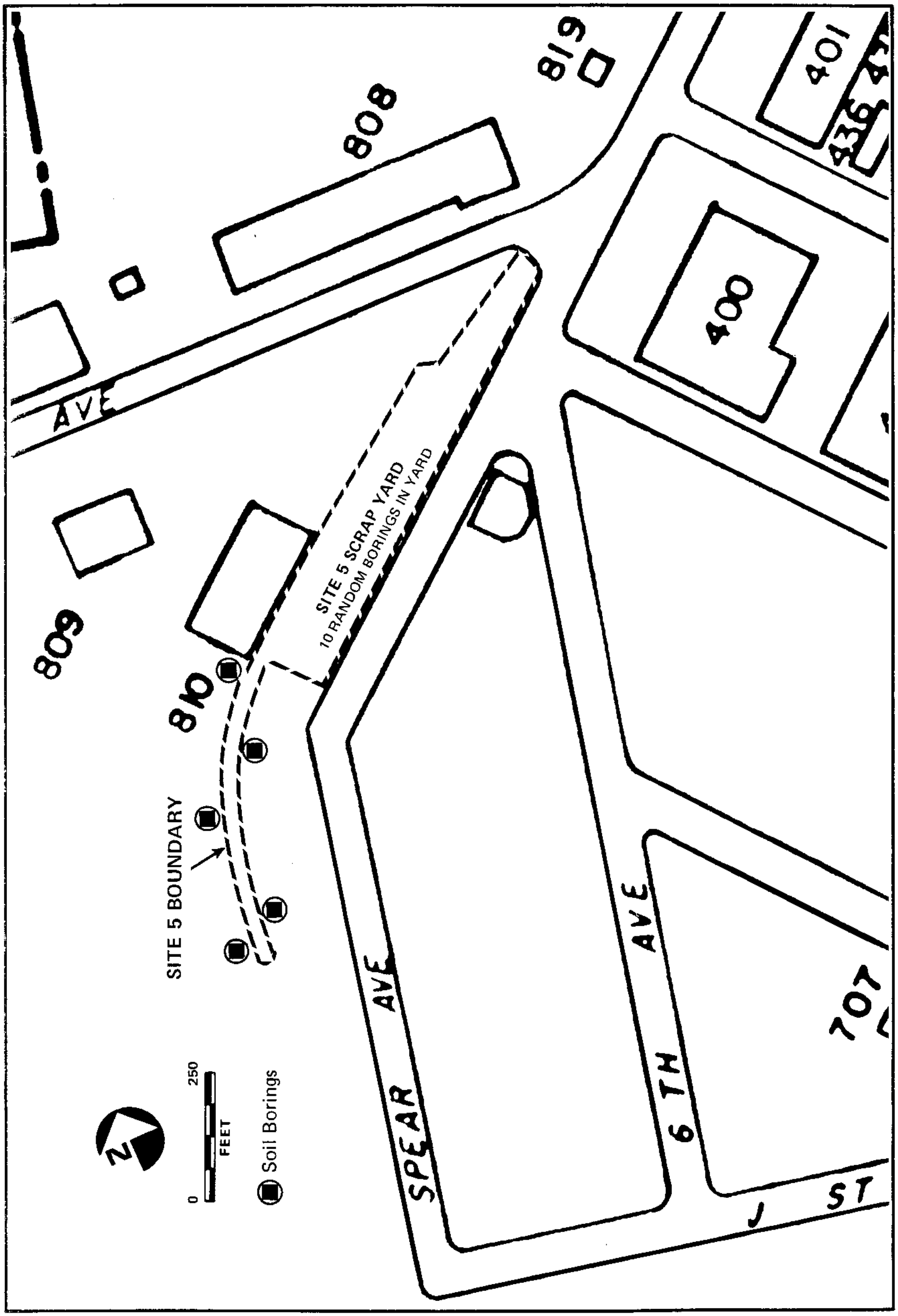

FIGURE 3-3

Site 5, Scrap Yard Confirmation Study

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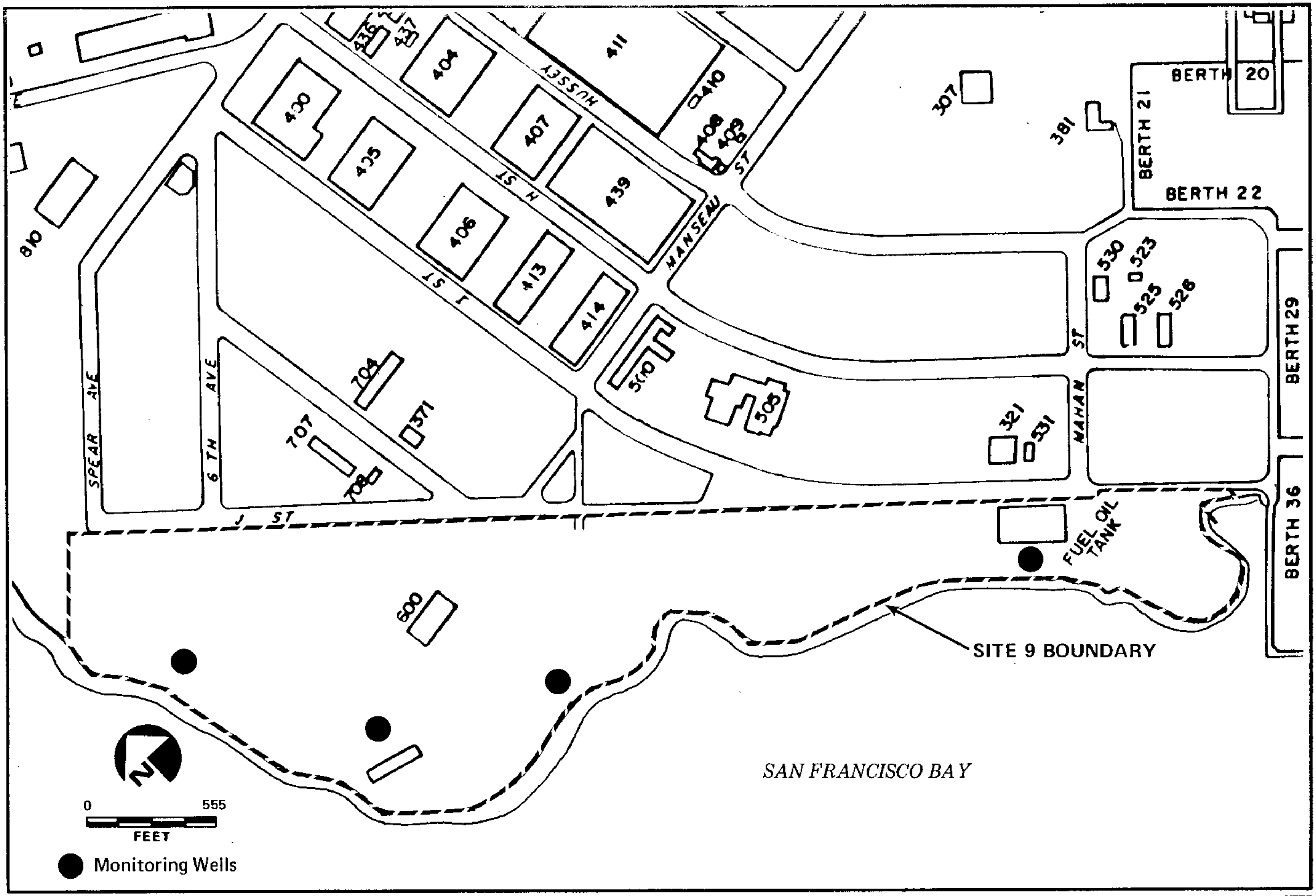
3.2.4 Site 6, Old Transformer Storage

• Type of Samples:	Soil
• Number of Ground Water Monitoring Wells	—
• Number of Soil Samples:	20
• Frequency of sampling	Once
• Number of Samples:	20
• Testing Parameters:	PCB
• Remarks:	20 surficial soil samples to a depth of 2 feet should be collected at the site. If PCBs in sufficient concentrations are found, a drilling program should be initiated to determine vertical distribution of PCBs in the unsaturated zone and to establish a ground water monitoring program.

3.2.5 Site 9, Bay Fill

• Type of Samples:	Ground Water Soil
• Number of Ground Water Monitoring Wells:	4 wells approximately 20 feet deep, 10 feet of casing/10 feet of screen
• Number of Soil Samples:	16 soil samples; 4 soil samples from each monitoring well boring
• Frequency of Sampling:	Soil: once Water: quarterly for 1 year
• Number of Samples:	Soil: 16 Water: 16
• Testing Parameters	Soil: PIGWP, lead, chromium, copper, zinc and tin Water: same as soil plus water levels
• Remarks:	Figure 3-4 provides a diagram of the suggested well locations.



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Site 9, Bay Fill Confirmation Study

FIGURE 3-4

3.2.6 Site 11, Battery and Electroplating Shop

- Type of Samples: Airborne particulates and floor scrapings
- Number of Ground Water wells: None
- Number of Soil Samples: None
- Frequency of Samples: Air: one-time, 8-hour low-volume sample of breathing zone air. Floor scrapings: one time.
- Number of Samples: Air: 4 air samples at different locations within building. Floor scrapings: 18 scrapings; 12 in battery shop, 6 in plating shop.
- Testing Parameters: Battery Shop: lead and copper
  Plating Shop: lead, chromium, copper, nickel, and zinc
- Remarks: The breathing zone air should be drawn through a filter designed to capture particles down to 0.1 microns in size.

3.3 NONCONFIRMATION SITES WITH RECOMMENDED MITIGATION MEASURES. This section is intended to identify potentially contaminated sites for which confirmation studies are not necessary. Each of these sites, however, pose a potential threat to human health or the environment and thus recommendations are made for mitigating actions.

3.3.1 Site 4, Abandonded 55-Gallon Drums. Seven 55-gallon drums have been stored west of Building 815 since 1977. Five of these barrels are unmarked and contain varying levels of liquid. One drum is marked styrene and one is labeled as pine tar. Additionally, a spill area on the ground surrounding the drums was observed.

Because of the unknown nature of the liquid stored in the barrels and because of the unknown identity of the fluid spilled on the ground, the IAS team recommends that the drums be hauled away and disposed of according to applicable regulations. The barrels should be opened and tests should be conducted to determine the exact nature of the material in the barrels. If a hazard is confirmed contaminated soil should be excavated and removed with the drums to an appropriate disposal site. If the drums are found to contain hazardous materials during mitigation action, then it is recommended that a confirmation study be considered for the soils at this site.

3.3.2 Site 7, Building 521 - Power Plant. The abandoned power plant located on the northeast side of "J" Street presently has waste asbestos and various chemical containers stored outside of the building. The asbestos is stripping off of equipment and falling onto the ground which poses a hazard to human health. This situation exists on the west side of the building. All asbestos waste materials should be removed, transported, and disposed of at an appropriate site and according to all applicable regulations. On the east side of the building where the walls of a storage building have been removed, chemicals such as metal conditioning agent, xylene, and paint are being stored on a concrete slab. These should be removed and properly disposed before leakage takes place.

3.3.3 Site 8, Pickling and Plate Yard. The steel pickling yard adjacent to Building 411 is currently abandoned; however, obvious coating of horizontal and vertical surfaces by green zinc chromate paint exists throughout the immediate area and may pose a hazard to public health.

A composite sample of this material should be taken and analyzed for chromium according to procedures outlined in the Draft California Assessment Manual (California Department of Health Services, 1983). If this material is determined to be a hazardous material, it should then be removed, transported and disposed of according to all applicable rules and regulations.

CHAPTER 4. BACKGROUND

4.1 GENERAL BACKGROUND.

4.1.1 Location. Hunters Point is located on San Francisco Bay in the southeast corner of the City of San Francisco on the point of a high rocky 2-mile long peninsula which projects southeastward into the Bay. The land area north and south consists of light industrial development. The center portion of the connecting land mass is an area of high density residential housing.

The geographic location of the Hunters Point Naval Shipyard (Disestablished) [HPNS], San Francisco and its natural characteristics are most favorable for shipyard operations. These characteristics include the protected harbor afforded by San Francisco Bay; the unrestricted approach channel with minimum water depths of 60 feet leading up to the piers, the berthing depths of which range from 25 to 45 feet; the large anchorage off the yard; and the supporting development of the surrounding area.

The channel leading to San Francisco Bay is restricted to approximately 1 mile in width at the narrow point and is an effective protection against possible tidal wave effects. With the normal tide range being approximately 6 feet, flooding is not considered to be a problem.

4.1.2 Adjacent Land Use. HPNS is situated in a section that is not typical of San Francisco in general. This region of San Francisco that lies south of Army Street and east of James Lick Freeway and Bayshore Boulevard is loosely broken up into residential, industrial and commercial-recreational areas scattered around the three hills - Mt. St. Joseph, Hunters Point Ridge, and Bayview Hill - which dominate the district called "South Bayshore." Industrial zones reach from the shore inland on the flat land between the hills.

The South Bayshore area covers 4020 acres, half of which are used for private industry. This is one-third of the land so used in San Francisco. In 1966, the 160 acres of temporary and permanent public housing located in this area were almost half of the City's total public housing land. Candlestick Stadium, the home of the San Francisco National League Giants baseball club, covers 78 acres, including parking, but local community parks and playgrounds cover only 35 acres.

Although the entire shoreline in South Bayshore, except for a portion of HPNS, is zoned for industry, much is underused, vacant, or in the process of being filled. The current approved land use in this area provides for heavy industrial activity along the Bay waterfront, extending inland an average of some 2000 to 5000 feet. This heavy industrial area follows around the HPNS waterfront area, thus bringing the heavy waterfront industrial area of the activity in consonance with adjacent land use. A marine terminal is directly north of HPNS.

The land area in back of the heavy industrial zoning is set aside for light industrial use. This zone forms a band varying from 500 to 3000 feet in width on both the north and south sides of the approximately 2-mile-long Hunters Point

Ridge. The remaining high ground on this peninsula is not adaptable for industrial use but is suitable for a light to medium density residential use. Thus, the light industrial zone coincides with the HPNS light industrial use encompassing the supply, service and administrative area. The high ridge which projects into the center of HPNS was used for quarters for military housing, thus coinciding with the residential development of the adjacent property.

The land occupied by HPNS can be divided into three functional areas: The basic industrial production area which includes the waterfront and the shop facilities of the Structural, Machinery, Electrical and Service Groups; the industrial support area which includes supply and public works facilities; the non-industrial area which once included the naval personnel support facilities such as barracks, BOQ, and recreation areas.

Generally, the basic industrial production area occupies the north and east portions of the HPNS site, the industrial support area the central and southwest portions of the site, and the non-industrial areas the northwest and south portions of the site.

Of the 964.91 acres at HPNS, housing and other non-industrial activities occupy 54.58 acres.

4.1.3 History. A peninsula in San Francisco Bay first known as "La Punta de Concha" (Sea Shell Point) and later "Point Avisadero" (Beacon Point) became the home of Robert and Phillip Hunter during the Gold Rush Days of 1849. Before long the area acquired the name "Hunters Point." In 1869, the California Drydock Company constructed the first commercial drydock on the West Coast here. The "Great White Fleet," on its round-the-world cruise of 1907-08, came to San Francisco Bay in need of repair. At that time the channel to the Navy facilities at Mare island was not deep enough to accommodate many of the major ships. Consequently, 23 of the vessels of the Fleet were serviced at Hunters Point. Recognizing the importance of this privately owned deep water drydocking facility, in 1916 the Navy agreed to subsidize construction of a third drydock, this one to be 1004 feet long and built on the site of Drydock 1. Drydock 3 was completed and first used by the Navy in 1919. These drydocks continued to serve all large deep draft vessels in San Francisco Bay until growing international tensions influenced the Navy to buy the Hunters Point Drydocks on 29 December 1939. They were leased to Bethlehem Steel Company until 18 December 1941 when the Navy took possession of "Hunters Point Naval Drydock" and developed the facility as an annex to the Navy Yard at Mare Island. Drydock 4 was added in 1943: in 1944 the submarine overhaul facilities with Drydocks 5, 6, and 7 were completed.

The Shipyard grew from a small group of workers transferred from Mare Island to almost 18,000 by the end of World War II. During this time, three Naval ships were built and 213 repaired. On 6 December 1945 it was redesignated as a separate Naval Shipyard.

Hunters Point was named the San Francisco Naval Shipyard and became increasingly diversified as a major fleet logistic support facility. Beginning with the conflict in Korea in 1950, the Shipyard again actively participated in the repair of ships.

When the Shipyard facilities at Hunters Point and those of Mare Island were placed under a single Command on 1 July 1966, Hunters Point became an industrial annex of the San Francisco Bay Naval Shipyard, Vallejo, California. The workload consisted primarily of repair and conversion of non-nuclear surface ships, including those with surface missile capability, and diesel submarine repair. In addition, some non-nuclear work on nuclear ships was done.

The facilities at Hunters Point again became a separate entity with the disestablishment of the San Francisco Bay Naval Shipyard and the establishment of (1) Hunters Point Naval Shipyard, San Francisco, California, and (2) Mare Island Naval Shipyard, Vallejo, California, effective 1 February 1970.

In a report by Naval Facilities Engineering Command, Western Division (WESTNAVFACENGCOM), Navy-controlled real estate in the Twelfth Naval District dated 1 July 1969 listed the count of 397 buildings with a total of 4,373,266 square feet of space for industrial purposes at Hunters Point. The 57 buildings for housing and other non-industrial activities have 107,870 square feet.

A large portion of the Shipyard's development occurred during the emergency period of World War II. Due to the restricted use of critical war materials, most of the structures were erected as temporary facilities to cope with the urgency of the situation at that time. Thus the design of a large number of shop buildings, storage warehouses, barracks, quarters, and many other supporting facilities is inadequate to sustain long range economical operations. Structures built after the second World War, including the basic facilities of the Naval Radiological Defense Laboratory (a separate Command), were designed as permanent facilities. Thus, HPNS is now a conglomeration of temporary and permanent facilities which were designed to meet different mission requirements at different times.

Waterfront facilities are of permanent construction. There are 24,000 linear feet of pier, quay wall, and wharf space providing 21 fully equipped repair berths and 19 deep water berths not fully equipped for repair--or a total of forty 500-foot berths. Hunters Point has six drydocks with varying sizes as follows:

Drydock No.	Width	Length	Depth Over Sill M.H.W.
2	114'4"	740'0"	29'0"
3	114'4"	1004'7"	40'0"
4	143'1"	1092'0"	47'0"
5	60'0"	420'0"	27'0"
6	75'0"	420'0"	27'0"
7	60'0"	420'0"	27'0"

The Shipyard has a regunning pier and a crane support structure. The crane bridges were removed in 1981 and the remaining support structure was overhauled. Quarters and rental housing are pre and post World War II construction. Some housing facilities were acquired with the acquisition of the land in the 40s.

The Hunters Point Naval Shipyard, San Francisco, was primarily an industrial operation for the modification, maintenance, and repair of ships. The mission of HPNS, San Francisco prior to its decommission in 1974 was to:

- Provide logistic support for assigned ships and service craft; to perform authorized work in connection with construction, conversion, overhaul, repair, alteration, drydocking and outfitting of ships and craft, as assigned; to perform research, development, and test work, as assigned; and to provide services and material to other activities and units, as directed by competent authority.

Tasks and functions assigned HPNS were:

1. Perform authorized shipwork in connection with the new construction, conversion, overhaul, repair, alteration, activation and inactivation of all types of naval ships, including missile ships; and perform outfitting of naval ships and service craft.

2. Design of naval ships.

3. Operate as planning yard for ship alterations.

4. Perform research, development, test and evaluation work, as assigned.

5. Perform research, development, test and engineering work on material handling for Replenishment-at-Sea projects as assigned by Naval Ships Systems Command.

6. Operate the West Coast Shock Facility to evaluate the design, construction and operation of combatant ships against attack by non-contact underwater weapons. As assigned, plan and conduct shock tests of shipboard equipment by using the Floating Shock Platform, provide technical support for conducting routine shock tests against operational ships, conduct Research and Development studies in the shock and vibration area, and perform measurement and analysis of test data.

7. Provide electronic and weapons engineering services, on request, to Navy and Coast Guard ships in the San Francisco Bay Area.

8. Conduct civilian and military training programs as required.

9. Provide accounting, civilian payroll, savings bond, military disbursing, public works, industrial relations, medical, dental, berthing, supply, messing, fire prevention and fire protection, security and other services to organizational components of the Department of the Navy and other U.S. Government agencies, as assigned or as requested by competent authority.

10. Serve as stock point for designated material controlled by Bureaus and Offices of the Navy Department, Naval shore (field) activities and various Defense Supply Centers.

11. Serve as material assembly and planning activity for military alterations authorized for accomplishment by private shipyards on Military Sea Transportation Service (MSTS) Navy-manned ships undergoing overhaul on the West Coast.

12. Provide outpatient medical care to Navy and Marine Corps personnel and their dependents, attached to the Shipyard, tenant activities, afloat units in the Shipyard, and retired military beneficiaries resident in the area.

13. Provide housing facilities, as available, for authorized military- and civilian personnel, including ships present.

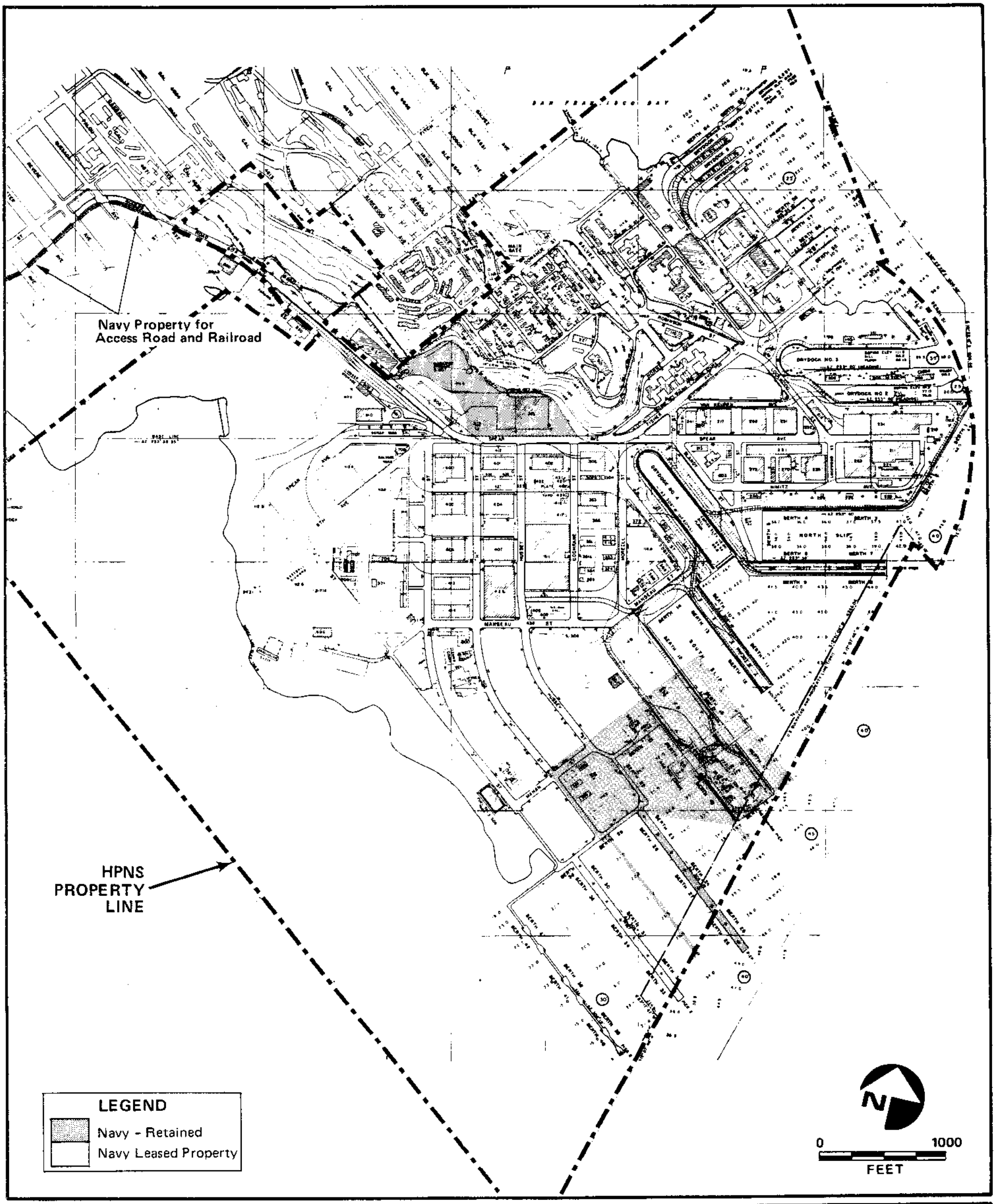
14. Provide controls for the procurement, handling, storage, use and disposal of sources of ionizing radiation as well as related facilities, which are associated with industrial operations.

15. Provide industrial support to the Westinghouse Polaris (now Trident II) Test Complex.

In April 1973 the Secretary of Defense announced that the Hunters Point Naval Shipyard would be closed on 30 June 1974 as part of the Department of Defense Shore Establishment Realignment Program. Plans for leasing Hunters Point Naval Shipyard were made during the spring and summer of 1974. In late 1975 all property at the Hunters Point Naval Shipyard was assigned to the Office of the Supervisor of Shipbuilding, Conversion, and Repair, San Francisco (SUPSHIP San Francisco). In May 1976 the Assistant Secretary of the Navy authorized leasing of Hunters Point to Triple A Machine Shop Incorporated, a commercial ship repair concern. In June 1981 Triple A's lease of Hunters Point was renewed for a second 5-year term. This lease term expires in 1986, with conditional renewals to June 1996. Triple A has leased over 80 percent of the Shipyard. Figure 4-1 shows the outleased and Navy-retained portions of the Shipyard. Triple A continues to use Hunters Point for ship repair of both commercial and Naval vessels.

Triple A is presently using six drydocks, adjacent berths, the machine shop and electrical buildings, the central power plant, a temporary power plant, and various office, warehouse and administrative service buildings. Triple A, in turn, subleases unused Shipyard facilities to 90 private warehousing, industrial and commercial firms.

4.1.4 Legal Actions. The one significant legal action which involved hazardous wastes occurred in 1975. A lawsuit filed by the Bay Area Water Quality Control Board was brought against SUPSHIP San Francisco in August 1975. The suit sought to prohibit the direct discharge of sanitary and industrial wastes into the San Francisco Bay. The injunction was withdrawn in October 1975 pending completion of a Navy pollution control project which when conducted would separate storm from sanitary sewers at the Shipyard. The project was completed in 1977.



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Map of Navy - Retained and Navy Leased Property

FIGURE 4-1

4.2 BIOLOGICAL RESOURCES.

4.2.1 Ecosystems.

4.2.1.1 Terrestrial Biology. The general area about Hunters Point is historically mapped as Coastal Prairie - Scrub mosaic (Kuchler, 1977). The prairie portion of the mosaic was historically composed of native bunchgrasses and the scrub component was probably dominated by Baccharis (Heady et al., 1977). Mixed evergreen forest (Sawyer et al. 1977) possibly occurred on the local hills about Hunters Point. Today Hunters Point is almost totally developed. Those open areas which are not as yet developed have been disturbed by construction or other operational activities and are for the most part disturbed weedy grasslands. Wildlife is expected to be composed primarily of urban-adapted species which can occupy vacant disturbed lands.

4.2.1.2 Marine Biology. San Francisco Bay has historically been an important area for many marine and anadromous species. It is the transitional zone between the freshwaters of the Sacramento - San Joaquin Rivers and the Pacific Ocean. There have been numerous commercial fisheries in the Bay since the 1840s. These included salmon, herring, crab, shrimp, sturgeon, anchovy and sardine. Hunters Point was a major fishing area for the Chinese who established numerous shrimp fishing camps along the northern shoreline. The early history of Hunters Point is documented in Skinner (1962).

The marine environment off Hunters Point is generally considered to be deepwater fisheries habitat. There are no shallow subtidal and intertidal mudflats immediately adjacent to HPNS shoreline.

The area around Hunters Point was utilized by bay shrimp, primarily Crago sp., and to a lesser extent by oysters (Ostrea sp.). At the present time, the expansion of Hunters Point into deeper waters and the extensive filling of tidelands on the southwestern edge of the Point has reduced potential habitat in the nearshore area (USDI 1970, BCDC 1982). Striped bass and other marine fishes are found off the Point in the deeper water areas. Various species of flat fishes including the stormy flounder (Platichthys stellatus) live in the southern bay.

In the recent past, the southern bay has deteriorated in quality due to sewage outfalls, increased urbanization, and landfills. However, there has been a dramatic improvement in water quality in the southern bay since the early 1970s after enhanced wastewater treatment and other water quality criteria were developed under the Federal Water Pollution Control Act of 1972.

4.2.2 Endangered, Threatened, and Rare Species.

Terrestrial - A number of state and federally listed animal species are known from the San Francisco Bay region. These include the Salt Marsh Harvest Mouse (Reithrondontomys raviventris), California Clapper Rail (Rallus longirostris obsoletus), California Brown Pelican (Pelecanus occidentalis californicus), the California Least Tern (Sterna albitrons browni). While all of these may have historically occurred within the immediate vicinity of Hunters Point, none with the exception of the California Brown Pelican, would be expected to utilize the study area or its immediate environ. The California Brown Pelican would be a visitor to the Point but does not nest in the general region.

No federally listed plant species are expected from the study area or immediate vicinity (USFWS, 1983b). A number of state-listed plants and plants listed by the California Native Plant Society (CNPS, 1980; 1981) are known from the penninsula, but are not expected onsite due to habitat preference and site disturbance (California Department of Fish and Game, 1982).

At the present time there are no marine fish or invertebrate species in the project area which are considered to be of special significance.

4.3 PHYSICAL FEATURES.

4.3.1 Climatological and Meteorological Data.

4.3.1.1 Bay Area. The San Francisco Bay Area enjoys a favorable climate. The annual normal temperature range is 28°F to 92°F. The normal annual rainfall is 21 inches, nearly all of which precipitates between October and April. The highest 24-hour rainfall intensity in the last 5 years was 1.4 inches in 1980. Snowfall is virtually unknown, thunderstorms are rare, and although wind velocities of 80 to 90 knots have been experienced, they are unusual.

In general, the Bay Region climate is a modified Mediterranean type. The winters are mild but rainy, and the summers are moderate but subject to drought. However, the area's topography causes considerable variation in both rainfall and temperature. Annual rainfall varies from 12 inches per year in eastern Alameda County to more than 50 inches per year in the higher mountains of Santa Clara and Sonoma Counties. The seasonal distribution, however, tends to be about the same throughout the area, as more than 85 percent of the rain falls between November and April. Tempered by cooling sea breezes and the high fogs of summer, coastal and Bay cities seldom experience temperature extremes. Also, the ground-hugging, winter tule fogs of the Central Valley seldom move across the Berkeley Hills. The ocean is warmer than the land during the winter months and this results in a moderating effect on coastal temperatures. Hence, daily temperatures can vary as much as 20 degrees between coastal and inland cities.

The basic physical features of the San Francisco Bay Region have set the stage for the smog problem. Prevailing moisture, salt-laden westerly breezes, temperature inversions, and the flat basin of the Bay generate potential smog conditions. The addition of man-made inputs of dust, soot, ashes, and gases in this large urbanized region creates the smog. The smog remains over the basin until strong breezes carry the pollutants away.

4.3.1.2 San Francisco Area. San Francisco's unique location at the northern end of a narrow peninsula which separates San Francisco Bay from the Pacific Ocean and forms the southern shore of the Golden Gate--the only sea level entrance through the Coastal Mountains into the Great Valley--causes San Francisco to be known as the air conditioned city with cool pleasant summers and mild winters.

Sea fogs, and the low stratus cloudiness associated with them, constitute another striking characteristic of San Francisco's climate. In the summertime, the temperature of the Pacific Ocean is unusually low near the coast and atmospheric pressure is relatively high, while the interior of California is characterized by the opposite in both elements. This tends strongly to intensify the landward movement of air and to make the prevailing westerly winds brisk and persistent, especially during the period from May to August. The fog or low-lying stratus cloudiness off the coast is carried inland by strong westerly winds during the afternoon or night and evaporates during the subsequent forenoon. Notwithstanding the occurrence of these stratus clouds, the sun shines on an average of 66 percent of the daylight hours in downtown San Francisco.

As a result of the steady sweep of air from the Pacific, there are few extremes of heat or cold. During the entire 88 years of temperature records in San Francisco, temperatures have risen to 90 degrees or higher on an average of but once a year and dropped below freezing less than once a year. As a rule, abnormally warm or cool periods last but a few days.

Winds from the land are extremely rare in summer and usually result only in some diminution of the cool onshore winds. The diurnal land-and-sea breeze characteristic of many coastal regions does not prevail here.

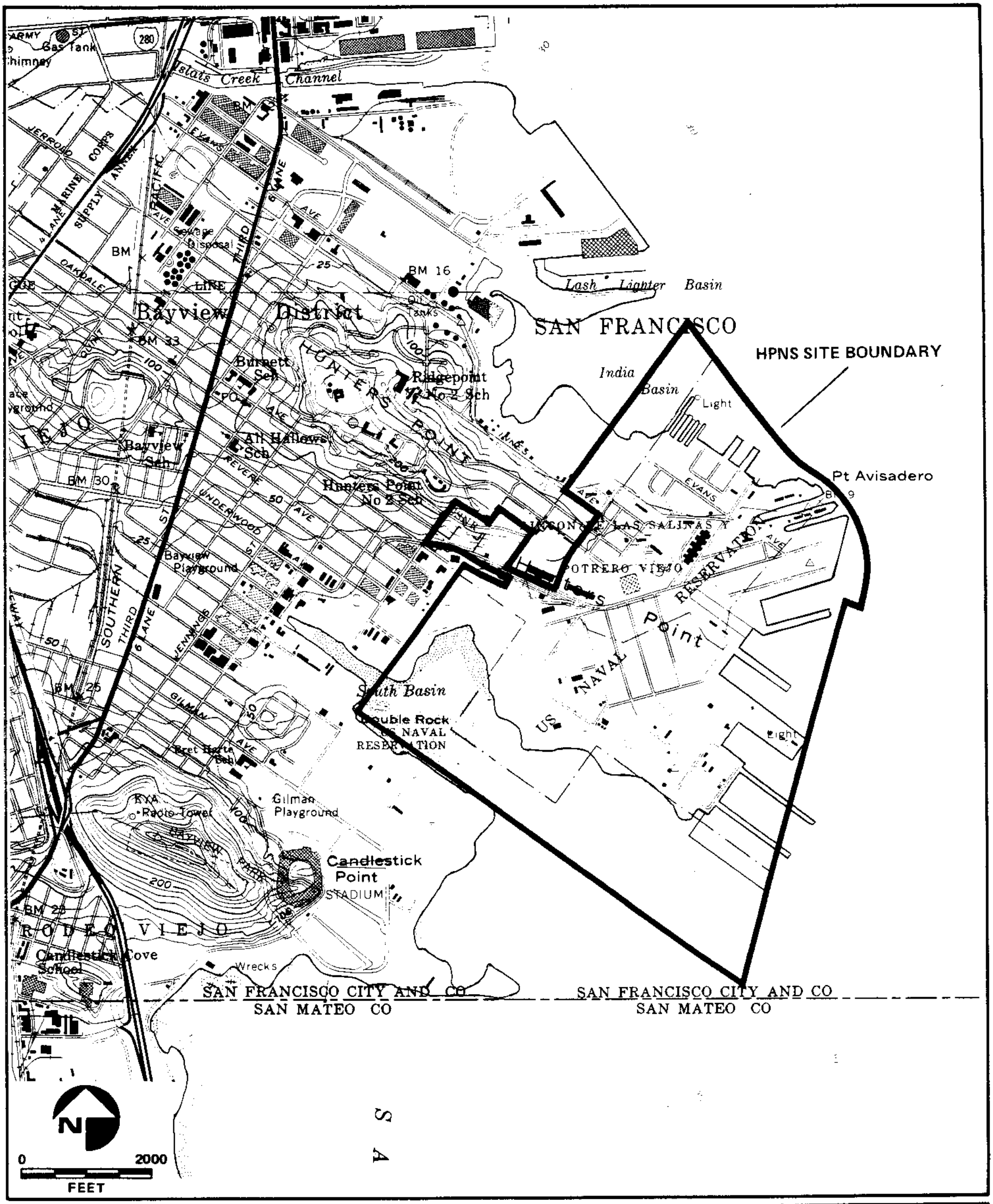
Pronounced wet and dry seasons are another characteristic of this climate. On the average, 84 percent of the total precipitation falls during the 5-month period, November to March, leaving but 16 percent for the remaining 7 months of the year. Measurable amounts of precipitation occur on fewer than 70 days a year. The Shipyard site is in a sector of San Francisco which is fog-free 98 percent of the time. Prevailing westerly winds serve to purge and clean the air continuously.

4.3.2 Topography. The San Francisco Bay Naval Shipyard, San Francisco, consists of approximately 982 acres of which 443 acres are submerged lands. Approximately 400 acres have been "man-made," shaped for buildings, roads and shipyard operations. Most of the "man-made" land is on a level plane about 12 to 15 feet above sea level. The remainder of the land is derived mainly from Serpentine and Basaltic rock and is on an uplifted, moderately steep to steep formation of Serpentine and Basalt rock with elevations to 240 feet above sea level (see Figure 4-2, Topographic Map).

4.3.3 Geology. Hunters Point is located in the San Francisco Bay Area on the east side of the San Francisco Peninsula. The Bay Area is in the central Coast Ranges of California, which consist of a number of nearly parallel ranges averaging about 50 miles in width. These ranges end abruptly along the west coast of California, and terminate more gently along the edge of the alluvial plain of the Great Valley in the east.

The San Francisco Bay occupies a valley which was inundated by slowly rising seas which received melt water from the vast continental glaciers of Quaternary time. The Bay is presently a shallow body of water. The deepest sections of the Bay are along old river channels. The basin of San Francisco Bay is an irregular down warp complicated by faulting and modified by erosion.

The region was occupied by a sea during Jurassic and Cretaceous time as indicated by wide spread deposits of marine sediments in the Coastal Ranges. These sediments are generally believed to have been derived from a land mass to the west which is now submerged beneath the sea.



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Topographic Map

FIGURE 4-2

The distribution of geologic material and stratigraphy of the Tertiary time, indicate deposits originating in embayments and arms of the sea which transgressed the Coast Ranges. The marine sediments interfinger with terrestrial sediments around the margins of the Tertiary seaways.

Volcanic products and associated intrusives were formed during most epochs of the Tertiary period. The volcanic deposits are typically interbedded with lake and stream deposits and mud flows. Therefore these deposits are considered very heterogeneous.

The Quaternary history of the Bay area has been primarily governed by sea level fluctuations as caused by glacial and interglacial stages and by differential uplift. Both of these processes are in all probability active in the Bay Area at present. Sea level fluctuations greatly influence the erosional - depositional regimen of streams and rivers. Such fluctuations are recorded in the stratigraphy underlying the San Francisco Bay. Deposition in the Bay has been occurring since the mid-Pleistocene; the sediments indicate alternate deposition of terrestrial and marine sediments. Stages of low sea level are indicated by the presence of stream channels, subsequently backfilled during the succeeding gradual rise of sea level.

4.3.3.1 Structural Geology and Seismicity. The regional structural trends in the central Coast Ranges is northwest-southwest; however, there are local variations. The major faults and folds, which trend northwest-southwest, control the orientation of ranges and valleys. Block faulting has been reported as the key structural evolution of the Coast Ranges in the Bay area. The Bay itself occupies a down-dropped or tilted block.

The largest conspicuous structural features include the San Andreas and Hayward faults. The San Francisco Bay area, as well as the area around Hunters Point, is one of the more seismically active regions in the United States. Three major fault zones which pass through the Bay Area in a northwest direction have produced over 12 earthquakes per century strong enough to cause damage, and five major earthquakes since 1836, the latest in 1906. These faults are part of the San Andreas Fault System, a major rift in the earth's crust that extends for at least 450 miles along the California coast, and includes the San Andreas, Hayward, and Calaveras Faults located 7 miles southwest, 10 miles northeast, and 20 miles northeast of the site, respectively. Several other faults of lesser or unknown seismic activity which also trend in a northwest direction in the general vicinity of the site include the San Bruno, Hillside, and the City College Faults, located 5, 4, and 1.7 miles southwest of the site, respectively. Although no active faults are known to underly HPNS, there is some ancient shearing and faulting of the Franciscan bedrock.

The actual structure of the Franciscan Formation is poorly known due to the lack of detailed exposures and to its structural complexities. The formation does not have distinctive marker beds or fossil assemblages, bedding is poorly developed, and there is much lateral variation in texture, thickness and lithology. Repeated crustal movements have left their mark in the intensity to which the Franciscan is sheared or shattered. It is reported that almost every exposure has one or more sets of slickensided slip planes and gouge zones.

According to Schlocker (1974), there is a major shear zone extending from the southwest, at Hunters Point, towards the northwest, towards Fort Point in the Presidio Military Reservation. This zone has been named the Fort Point-Potrero Hill Hunters Point Shear Zone.

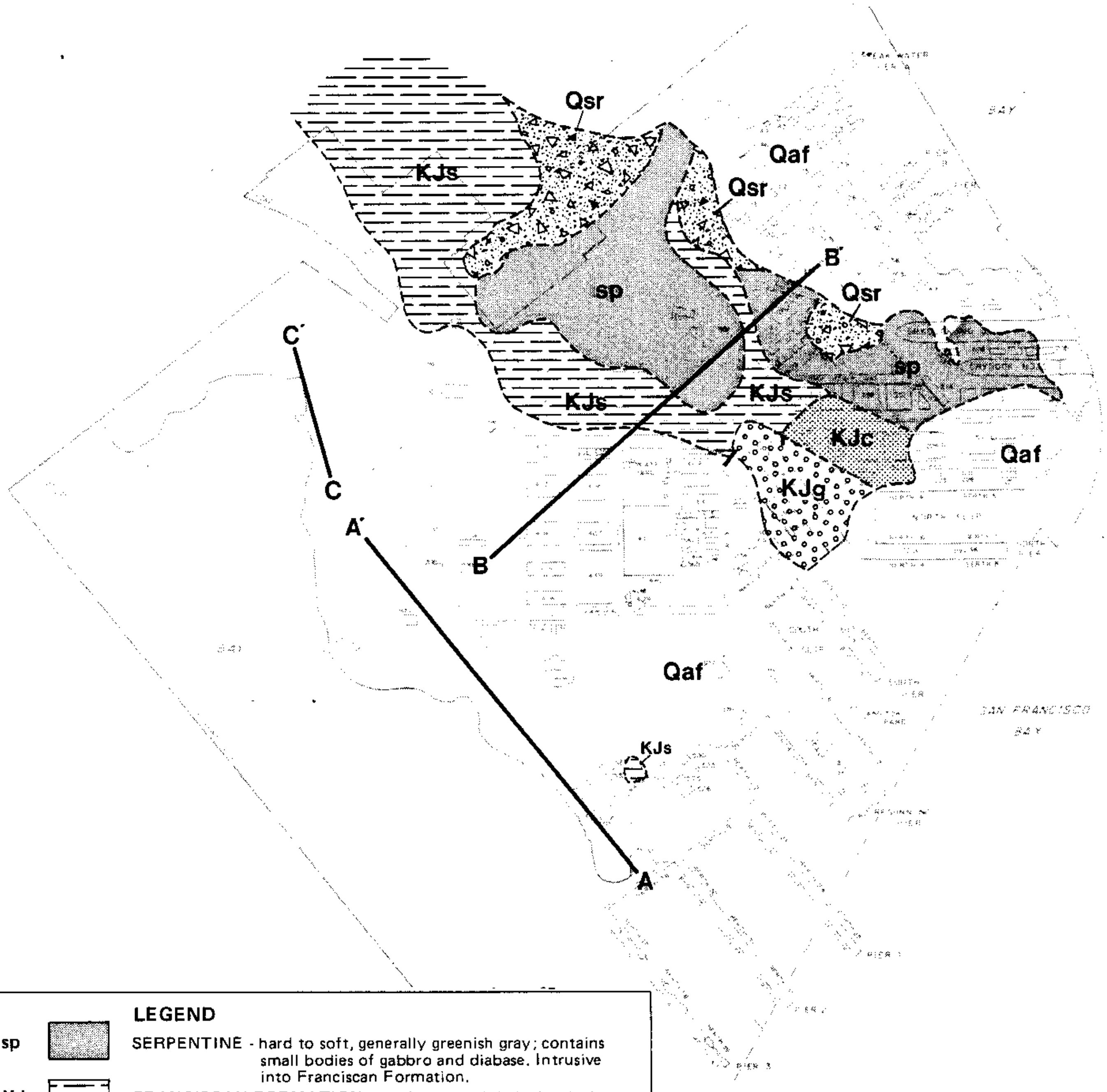
4.3.3.2 Stratigraphy. Hunters Point area of the San Francisco Bay is underlain by rocks which range in age from Jurassic-Cretaceous to recent. The location of formations at Hunters Point is shown on Figure 4-3. A description of the formation is given below. The map also shows the locations of cross sections A-A', B-B', and C-C' which are shown in Figures 4-4, 4-5, and 4-6.

The Franciscan Group, Jurassic-Cretaceous age, is one of the most extensive assemblages of rocks in the Coast Ranges. It occupies approximately one-fifth of the total area of California, but does not outcrop east of the Coast Ranges. In the San Francisco Bay Area, the Franciscan group is not present west of the San Andreas fault and its closely associated branch faults. At Hunters Point, the Franciscan is bedrock and forms most of the original point. It underlies the basin sediments and consists of sandstone and shale, chert, greenstone (altered volcanic rock) and serpentine. The rock typically has widely varying physical properties and often exhibits a chaotic structure due to its complex mode of formation.

The sandstone (graywacke) portions of the Franciscan is interbedded with siltstone and shale. The sandstone is fine to coarse grained, largely medium grained; greenish gray and hard where fresh, buff colored and firm to soft where weathered. It is generally fractured at close spacings, in places at moderate spacing. The shale and siltstone interbeds are estimated to constitute less than one-fifth of the total volume of this unit. They are dark gray to greenish gray where fresh, and commonly remain grey where adjacent sandstone is weathered buff. More detailed descriptions are given by Schlocker (1974).

Chert zones also are found at Hunters Point. The chert, distinctly interbedded with shale, is hard and brittle and generally occurs in thin to medium beds alternating with thin beds of shale. Fresh chert is predominantly red brown or grey green; when weathered and faulted, the chert is found to be altered to a soft tan to buff color.

Serpentine forms major portions of the hills or high lands in the shipyard. The source of serpentine has been reported to be injected or intruded into the Franciscan sedimentary rocks as a molten igneous rock, similar to the lavas which are emitted from volcanoes. According to Brabb et al. (1972) when the serpentine melt cooled and consolidated into rock, it was composed of periodotite, which is an aggregate of small crystals composed of silicates of magnesia and iron. The chief consituent mineral is peridot, a form of olivine. At the time of the consolidation of the melt, the composition of constituent silicates did not contain water. As it was intruded into the upper portion of the crust and cooled in the sedimentary host material, water was added to the dry silicates of magnesium and iron to convert these minerals to a hydrous-green silicate mineral. This change in the chemical and physical character of the rock involved an increase in volume, so it swelled and sheared upon itself, causing openings in which new minerals were deposited. This reduced the tensile strength of the mass. The swelling also greatly accentuated the deformation of the shale and sandstone at the contacts.

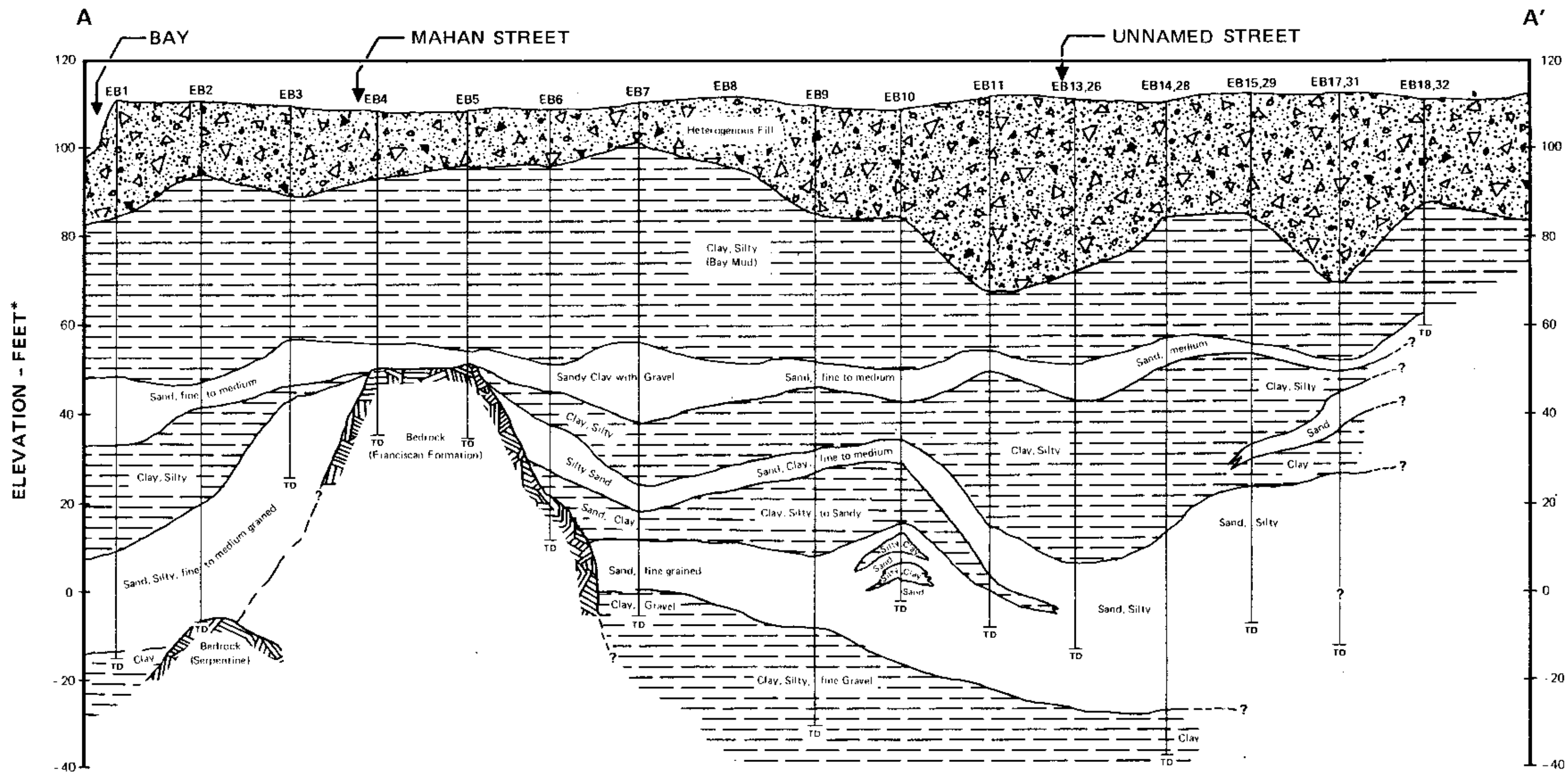


LEGEND

sp		SERPENTINE - hard to soft, generally greenish gray; contains small bodies of gabbro and diabase. Intrusive into Franciscan Formation.
KJs		FRANCISCAN FORMATION - sandstone and shale; hard where fresh and intact, soft where weathered or sheared.
KJc		FRANCISCAN FORMATION - Chert; hard chert interbedded with firm shale.
KJg		FRANCISCAN FORMATION - Greenstone; altered volcanic rocks
Qsr		SLOPE DEBRIS AND RAVINE FILL
Qaf		ARTIFICIAL FILL

Based on Preliminary Geologic Map of the San Francisco South Quadrangle and part of the Hunters Point Quadrangle, California. M.G. Bonilla; 1971.

INITIAL ASSESSMENT STUDY HPNS, SAN FRANCISCO	Geologic Map	FIGURE 4-3



Section A - A′

*Navy Datum: Mean low low water = +100.0

Note: Stratum lines are based upon information obtained from borings and may or may not represent actual subsurface conditions. Boring information from: Foundation Investigation, Lowney, Kaldveer Associates; 1972

Vertical Exaggeration = 10X

See figure 4 - 2 for location

Horizontal Scale

0 200 400

FEET

S. Lawn 3/84

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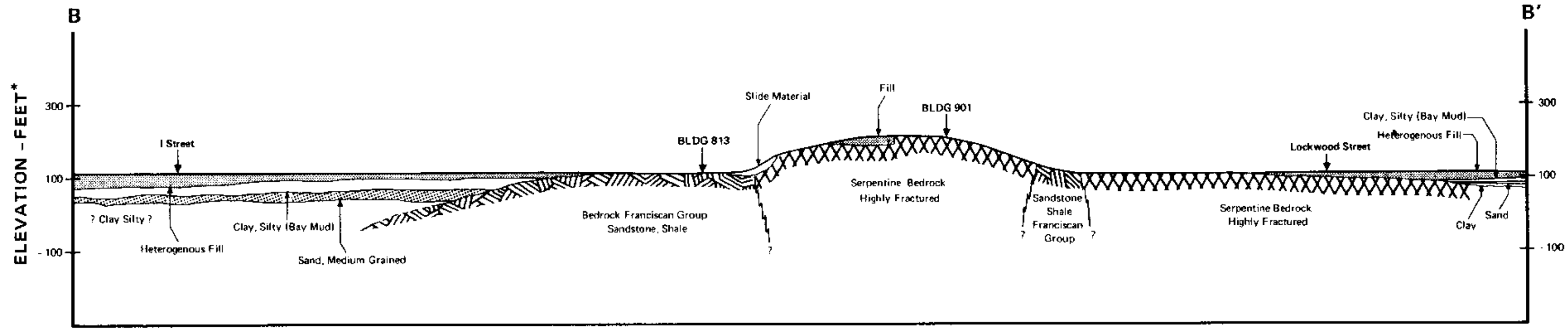
HPNS, SAN FRANCISCO

Geologic Cross Section A - A′

FIGURE 4-4



Section B - B'

*Navy Datum: Mean low low water = +100.0

Note: Stratum lines are based upon information obtained from borings and may or may not represent actual subsurface conditions. Boring information from: Foundation Investigation, Lowney, Kaldveer Associates; 1972

See figure 4 - 2 for location

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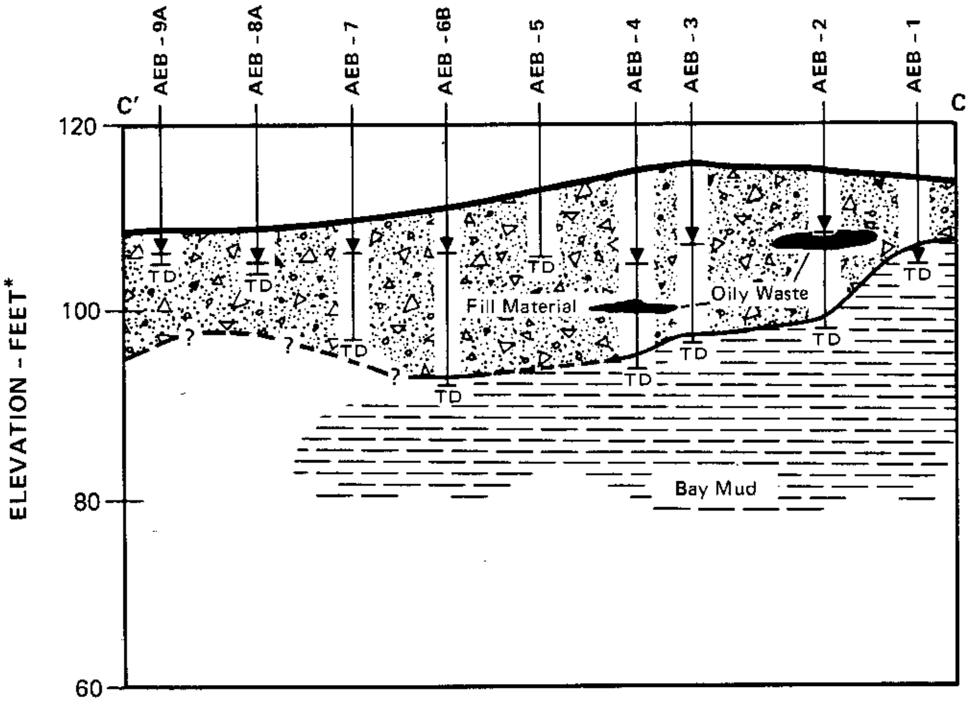
Geologic Cross Section B - B'

FIGURE 4-5



Section C' - C

Horizontal Scale

0 200

FEET

Approximate location of water table

*Navy Datum: Mean low low water = +100.0

Information from boring logs.
STORM SEWER INTERCEPTOR - PHASE III
Dept. of the Navy, San Francisco, 1977

See Figure 4 - 2 for location

INITIAL ASSESSMENT STUDY
HPNS, SAN FRANCISCO

Geologic Cross Section C - C'

FIGURE 4-6

The alteration process discussed above results in radical and unpredictable variations in the quality of the serpentine; it ranges from hard rock to a medium soft material resembling soapstone within a few feet either horizontally or vertically. This has been noted in the literature when building structures upon the serpentine. Excavating the serpentine disturbs the delicate equilibrium that was slowly reached by natural processes. The newly exposed serpentine begins a new stabilization regime which is greatly accelerated by cracks that develop and provide new channels for air and water to penetrate the mass. This has been demonstrated near the wall area of Building 813. During a study (Dames and Moore, 1963) carried out in 1963, the serpentine was described as a soft clay. This was in complete contrast to the description of the rock in 1947. At that time, the serpentine was hard and sound. Therefore, the rate of weathering of the serpentine is very rapid and drastic changes in physical properties can occur.

Near the shipyard there are unconsolidated deposits of sand, gravel and, clays overlying the Franciscan Group as shown on the cross sections in Figures 4-4, 4-5, and 4-6. The location of these cross sections are shown in Figure 4-3. These materials may be late Tertiary or early Quaternary; the precise age is uncertain. The sand and gravel formations overlying the Franciscan at Hunters Point is most likely part of the Bay Mud. There is a possibility that the coarser material may be part of formations that are older than the Bay Mud. Not enough data is available to make these determinations.

This Quaternary San Francisco Bay Mud is predominantly silty clay with local interspersed lenses and layers of sand, gravel, peat, and shell fragments. The mud is blue gray, dark gray or black in color, and contains abundant organic matter. It is soft and plastic throughout, except within several feet of the ground surface where it may be dry, becoming firm and light greenish gray, and developing large cracks. It commonly contains 50-60 percent water and abundant swelling clay. In some places it contains distinct to indistinct medium to thick beds separated by discontinuous laminations and thin to medium beds of sand, gravel, peat, or shell fragments. The mud commonly grades downward into generally poorly sorted sandy clay, but in other areas there is an abrupt change downward to silt, sand, gravel, or peat. The mud varies in thickness from 1 foot near the landward edge to 60 to 120 feet beneath the Bay.

Underneath the shipyard, the Bay Mud is a soft, silty clay of high plasticity and contains shells. According to Lowney (1972), the mud in some areas exhibits the effect of 30 years of consolidation, which has resulted in greater strength and density than for unconsolidated mud. The Bay Mud layer is underlain by sand and stiff clays. The thickness and geometry of these formations along with their relationship to bedrock is shown in the cross section on Figures 4-4, 4-5, and 4-6.

Overlying the Bay Mud at HPNS is artificial fill. This material is loose to firm gravel, sand, silt, clay, rock fragments, vegetable matter and man-made debris in various combinations. In some areas, borings also have shown oily wastes (Figure 4-6). Available information indicates that a major portion of the shipyard was reclaimed from San Francisco Bay in 1941 and 1942 by filling on the soft Bay Mud with soil and rock materials obtained predominantly from a hillside excavation in the northern portion of the Shipyard. Filling apparently created large displacements of the soft Bay Mud resulting in large variations in both the thickness of Bay Mud and overlying fill layer. Subsequent to placing the fills, the underlying Bay Mud has consolidated to varying degrees under the weight of the fill. As a result of this consolidation, the reclaimed portion of the Shipyard has been gradually settling (Lowney, 1972). Settlement records maintained by the Public Works Department at the Shipyard indicate settlement of up to 2.2 feet occurred during the period of 1946 through 1958. It has been extrapolated by engineers that continued settlement may be as much as 5 feet.

4.3.3.3 Geologic Hazards. The major geologic hazards at Hunters Point are earthquakes and landslides. Potential earthquake zones are discussed in the section on seismicity. Landslides have occurred around the areas having steep slopes. Landslides have been a continuing problem behind Buildings 813 and 815. These failures occur for many reasons and are discussed by Bonilla (1960), Dames and Moore (1963), Hawke (1967), and Hyde Forbes (1952).

4.3.4 Soils. The distribution of soils at Hunters Point is shown on Figure 4-7. The soils series, as classified by the U.S. Soil Conservation Service (SCS), include Bicknell sandy loam, "made soils," Montara gravelly clay loam, and Montara gravelly loam. The following soil descriptions are from the SCS (1960):

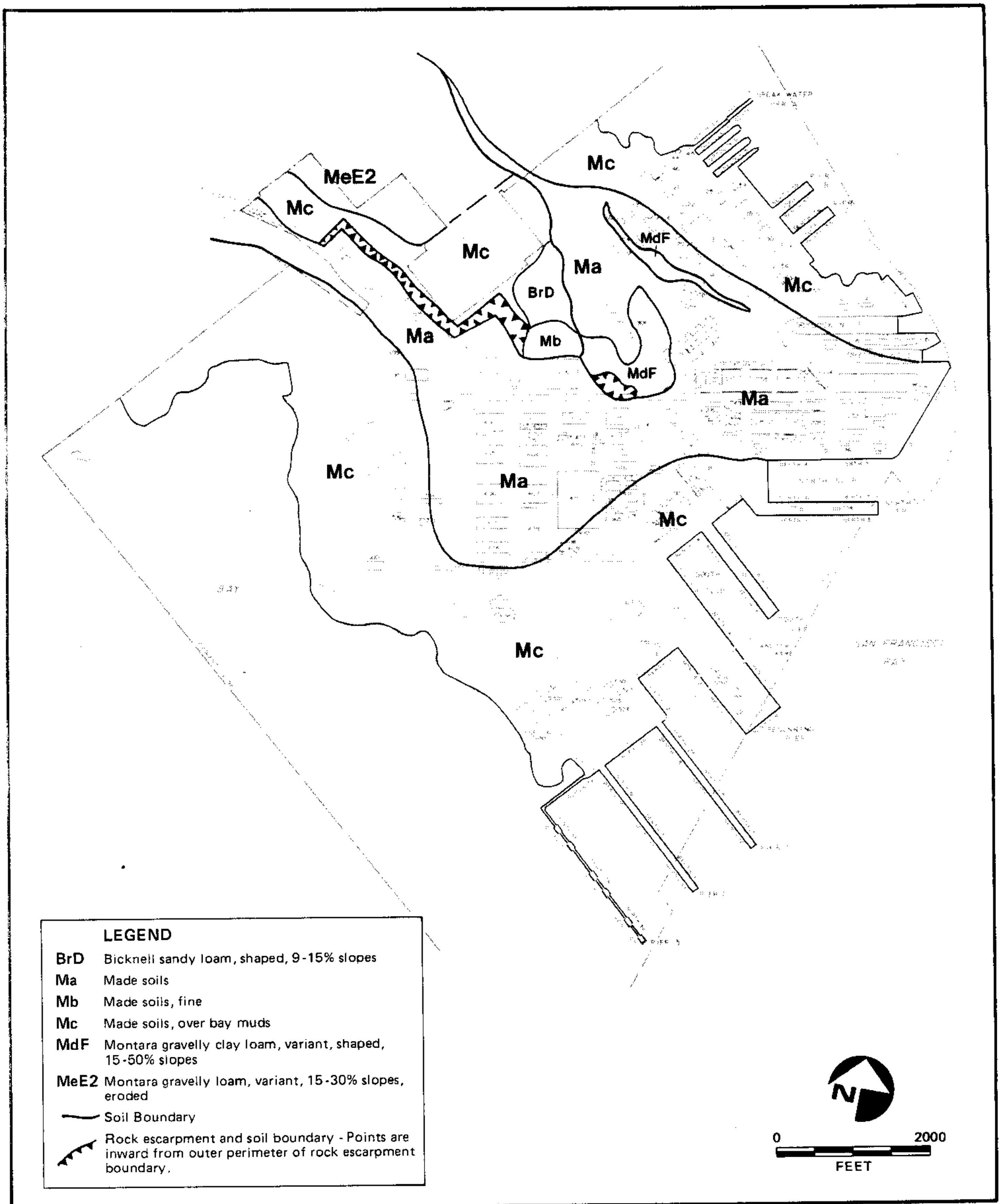
DESCRIPTION OF SOILS

BICKNELL SERIES

> Bicknell series consists of deep to very deep, slightly acid, well drained, moderately coarse-textured soils. They developed in alluvium from mainly sedimentary sources. This soil is underlain by serpentine redisuum. They occur on shaped, modified, strongly sloping bench remnants. The surface soils are typically dark grayish brown sandy loams, massive, slightly hard, slightly acid, and 20 to 30 inches thick. The subsoils are yellowish brown sandy loams, prismatic, hard to very hard, slightly acid and more than 36 inches thick. Unrelated substrata at depths mostly below 48 inches are stratified, gravelly clay loams to gravelly clay serpentine materials.
>
> These soils are used for urban housing, lawns, and ornamental plants. This soil covers about 10 acres above building #813 to the northeast entrance gate of Hunters Point.

MADE SOILS (Ma)

> Made Soils consist of deep cuts and smooth-shaped fills over metamorphic and basic igneous bedrock. Most of the fill material consists of basalt and serpentine cracked bedrock and gravelly loams to gravelly clay loams of Montara soil variant. These areas occupy deeply-cut, smoothed uplands. Areas left for landscaping have been shaped mostly level but range to sloping with mostly Montara variant gravelly clay loam and some gravelly loam underlain by bedrock at depth from 12 to 36 inches. Small bedrock escarpments from cuts are included with



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Soils Map

FIGURE 4-7

this unit and shown by rock escarpment symbols. These soils occur on nearly level to steep slopes.

These soils are used mainly for hard-surfaced roads and storage or equipment areas, and buildings. Small areas are landscaped with ornamental plants and grasses.

MADE SOILS, FINE (Mb)

Made soils, fine, consist of a mixed area of deep cuts and a shaped fill of mixed gravelly clay loam of the residuum and hauled-in clay from an undetermined sedimentary residuum or alluvium source. Effective depth ranges from 10 to 36 inches but small areas may be deeper or shallower. Underlying bedrock is a cracked structure in the fault zone and is subject to slipping and movement. Much of the cracked bedrock is clay coated and deep borings indicate there may be interrupted lateral clay layers separating bedrock layers. They occur on moderately steep uplands.

MADE SOILS, OVER BAY MUDS (Mc)

Made Soils, over bay muds consist of very deep fill material over the formerly underwater soils of San Francisco Bay. Materials for fill came from bedrock of the nearby serpentine and basalt formation, gravelly loam, gravelly clay loam, clays, and sandy loam soil material. This nearly-level area is used for storage, roads, buildings, equipment, and playground areas. Open soil areas are variably affected by broken bedrock fragments and no attempt has so far been made to use ornamental plants.

Some subsidence and wave bank erosion is to be expected in this area. These are mostly nearly-level lands except at bank edges.

MONTARA SERIES (Variant)

Montara Series, variant, consists mostly of shallow, neutral to moderately alkaline, non-calcareous, somewhat excessively drained, medium and moderately fine textured, gravelly soils. They were formed mainly on serpentine and basaltic bedrock. They occur on moderately steep and steep uplands; many have been graded and shaped. The surface soils are typically dark gray, gravelly loams, granular, hard, neutral and 4 to 12 inches thick. The subsoils are dark grayish brown gravelly clay loams, fine blocky or granular, hard, moderately alkaline, 7 to 14 inches thick. Underlying bedrock is variably decomposed metamorphosed and basic igneous bedrock at depth from 12 to 20 inches.

Colors of the gravelly loam and gravelly clay loam surface soils are dark gray, very dark gray. The gravelly clay loam subsoils range in color from gray, dark grayish brown to very dark grayish brown.

Included are small areas of exposed bedrock and soils over 20 inches deep due to shaping. Small areas are somewhat stony in the profile. Past erosion has removed an estimated 2 to 4 inches of top soil on about 60 percent of the area. They occur on smooth, moderately steep upland.

According to the SCS, the Bicknell soils have moderate infiltration rates when thoroughly wetted. They are moderately well to well drained and have a moderate rate of water transmission. All other soils at Hunters Point, according to the SCS, have slow infiltration rates when thoroughly wetted. They consist chiefly of clay soils with a high swelling potential, with a high permanent water table, with claypan or clay layers at or near the surface, and maybe impervious materials. These soils have a very slow rate of water transmission. The SCS categorizes the permeability of these soils as less than 0.63 inches per hour (4.4×10^{-4} cm/sec). It is assumed that permeability values are obtained through percolation tests and therefore represent unsaturated vertical permeability.

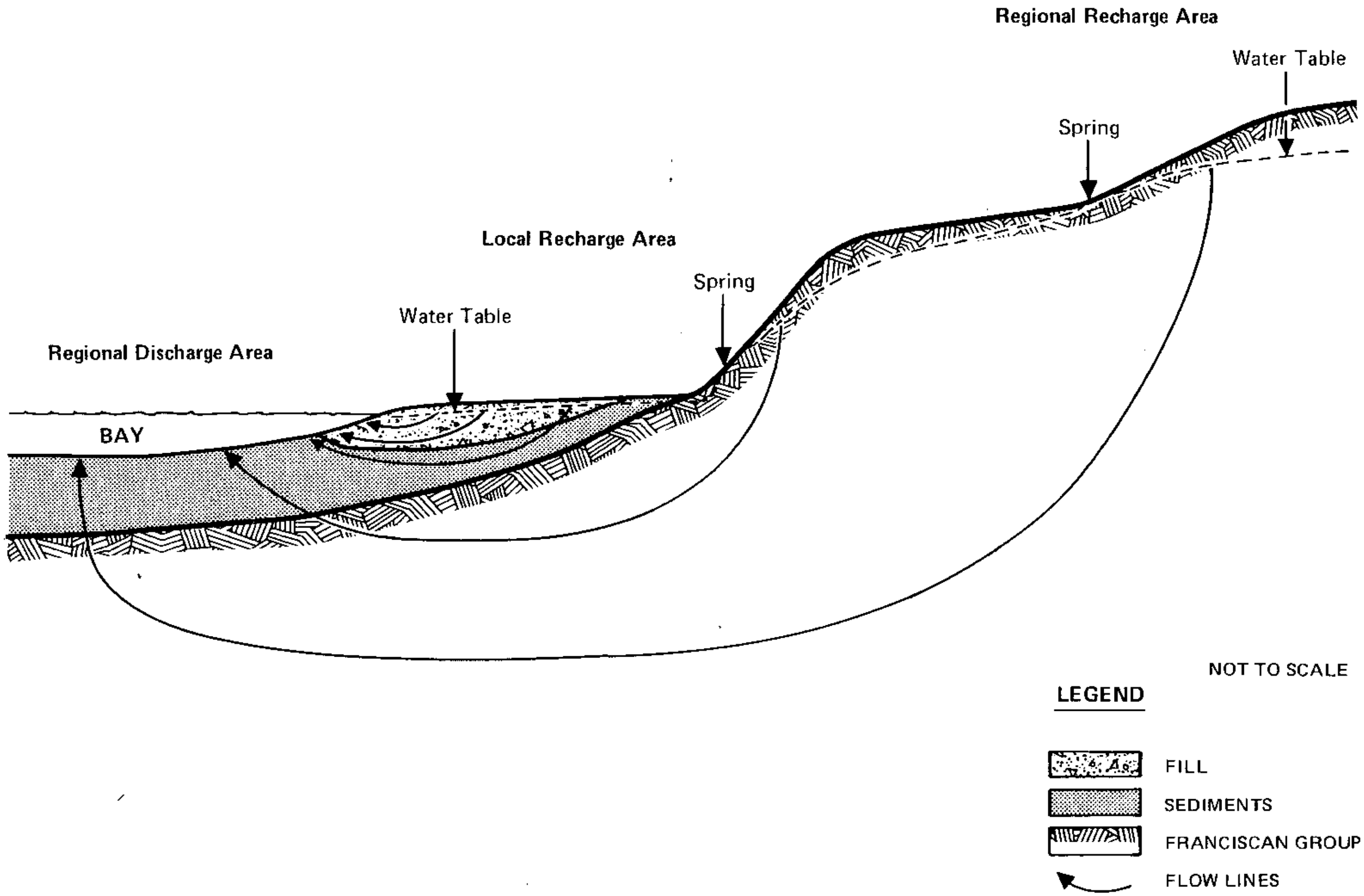
4.3.5 Water Resources. The potable water supply for Hunters Point is derived from the City of San Francisco, Department of Water Quality. Ground and surface water in the vicinity of Hunters Point are not used for domestic drinking water purposes. According to the San Francisco Department of Water Quality (personal communication, 1984), there are 73 wells within a 3-mile radius of HPNS. As of 1977 only four of these wells were operational. In addition, there is a spring located on Evans Avenue which is located within 1 mile of HPNS. This spring is being used for bottling water by Mountain Springs Water Company. There are no operational wells located within a 1-mile radius of HPNS. However, there is one operational well within 2 miles. This well is located at 250 Williams Street. Within the 3-mile radius there are three more operational wells, located at 1726 Alabama Street, 129 Raymond Street and 2601 Neahall Street.

The spring mentioned above eminates from fractures in the Franciscan Group at elevations greater than 200 feet (Navy datum). This indicates that any potential contamination occurring at HPNS could not affect the spring. The recharge area for the spring is at higher elevations and probably to the northwest of the bottling plant. Most of the industrial activities at HPNS occur at elevations of 100 to 120 feet (Navy datum) and south of the bottling plant.

4.3.6 Hydrogeology. The areas at the lower elevations at the shipyard are within a regional ground water discharge area and therefore ground water within HPNS will eventually discharge to San Francisco Bay. This flow includes ground water from both the fractured bedrock aquifers, the unconsolidated formations, and the fill. An example of this type of flow system is shown in Figure 4-8.

As a regional recharge area, the highlands, which may be miles from the Bay, receives recharge where the flow is predominantly downward. The flow eventually becomes horizontal and finally is predominantly upward as it discharges into the regional discharge area. Between the regional recharge and discharge areas, many local flow systems may exist.

The local flow systems are superposed upon the larger, regional system. However, on a local scale, many recharge areas may exist to shallow flow systems.



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Conceptualization of Ground Water Flow System

FIGURE 4-8

The important concept to note is that this local recharge cannot migrate great distances through the ground water system. Figure 4-8 illustrates that ground water from both the local and regional systems will be discharged to the Bay. The local flow systems are controlled by seasonal changes in infiltration, evapotranspiration, and the tidal stage of water in the Bay.

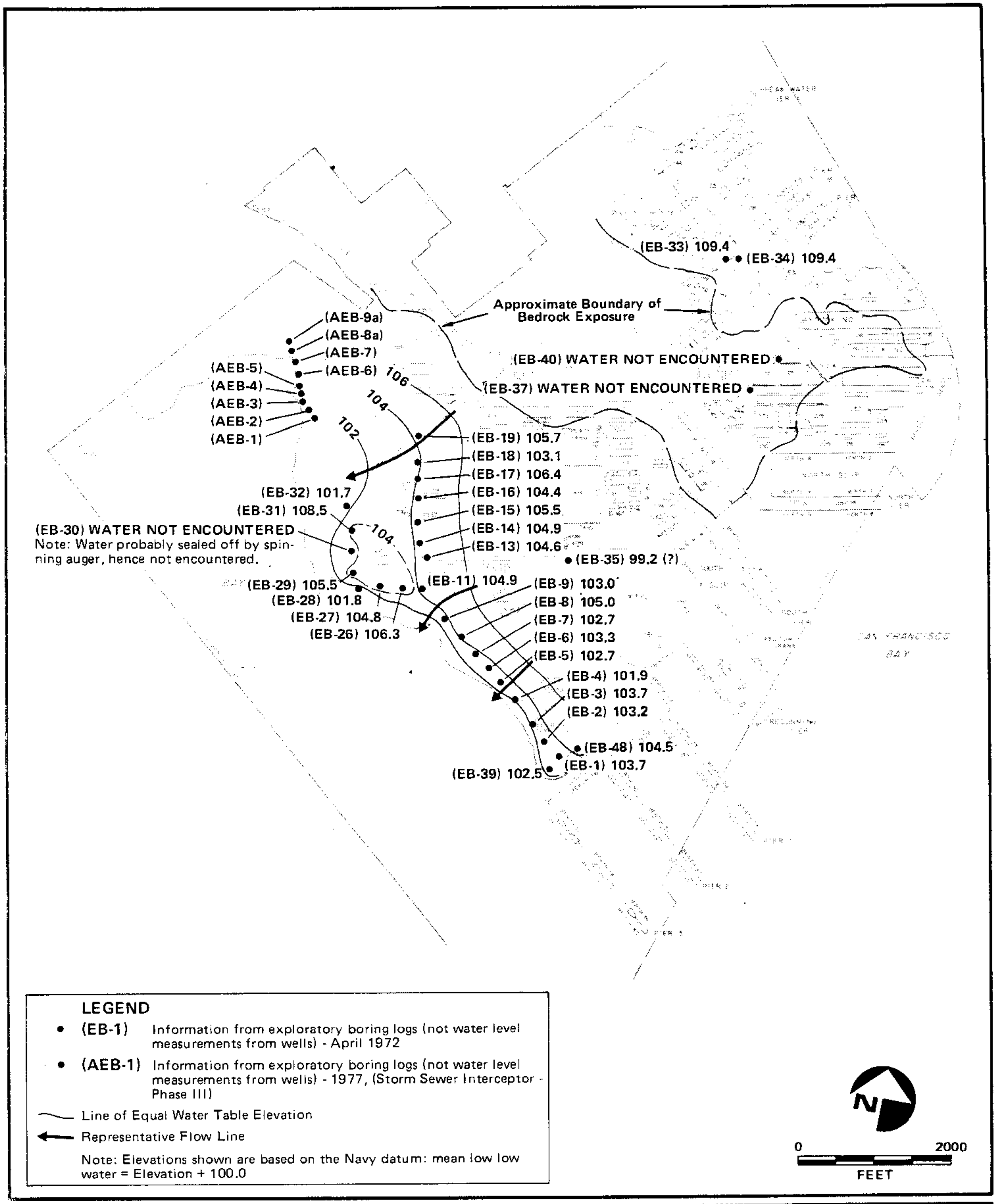
4.4 CONTAMINANT MIGRATION POTENTIAL. The effect of the regional and local flow systems described above on contaminant migration can also be conceptualized. Mobile contaminants from industrial activities at the shipyard that could enter the flow system would occur at low elevations on either the shipyard fill or bedrock areas. Therefore these contaminants would eventually discharge to the Bay.

From existing boring data, an approximate water-table map was constructed as shown in Figure 4-9. Although these water-levels are from a drillers log and not from measured levels in a well, interpretation of the information enables the flow directions to be estimated. From the map, it is apparent that ground water flow does occur through the sediments and bedrock. The flow directions are shown as arrows on Figure 4-9. Therefore, if the ground water became contaminated, these contaminants can migrate towards the Bay. As the hydraulic conductivity is probably greater in the fill than the bedrock the velocity of migration will be greater in the fill. In the area underlain by rock (see geologic map), the potential is lower due to the lower hydraulic conductivity. In the Franciscan bedrock, the contaminants would enter and flow in the more fractured sections of the rock.

Darcy's Law was used to estimate the velocity of ground water flow and contaminant migration. Those computations use the hydraulic gradient which can be estimated from Figure 4-9 and the hydraulic conductivity (pearmeability) and porosity of the geologic material of concern. The hydraulic conductivity and porosity were estimated (Freeze and Cherry, 1979) by comparing the fill material at HPNS with other similar material where published estimates have been made. In addition, the affect of the process of absorption and chemical reactions in the subsurface have been ignored for these computations. The effect of density or specific gravity also can impact migration potential. For example, fuel oil will "float" on top of the water due to its lighter specific gravity and carbon tetrachloride will sink due to its higher specific gravity. These effects only can be determined with field measurements.

From the map in Figure 4-9 (assuming, for the purpose of estimating velocities, that flow is horizontal) the hydraulic gradient has been computed to be approximately 0.008 ft/ft. The fill material can have an extreme range in hydraulic conductivity. It is assumed that a large portion of the material is fine grained. Therefore for this analysis, the hydraulic conductivity has been estimated to be 10 gallons per day per square foot (Freeze and Cherry, 1979) or 1.3 feet per day (6×10^{-4} cm/sec). The effective permeability, porosity has been estimated to be 25 percent. Therefore, using Darcy's law, the potential velocity of contaminant migration is about 0.04 feet per day or 15 feet per year.

There are no potable water wells that would be affected by contaminant migration from HPNS. Ground water at HPNS is shallow, from just below land surface to 10 feet deep. Ground water underlying HPNS flows toward the Bay. All surface



INITIAL ASSESSMENT STUDY HPNS, SAN FRANCISCO	Approximate Configuration of Water Table	FIGURE 4-9

water runoff, that is not collected by the storm water sewer system, drains naturally towards the Bay.

The potential contaminant receptors at HPNS are the marine life in San Francisco Bay and humans that would come into direct contact with contaminated land surfaces. As described in Section 4.2, Biological Resources of this report, there are no endangered marine fish or invertebrate species in the Bay surrounding HPNS. However, the Bay marine habitat in the nearshore area of HPNS is used for recreational and (limited) commercial fishing.

CHAPTER 5. WASTE GENERATION

This chapter describes the industrial, ordnance and radiological operations that over the past years have generated hazardous wastes at Hunters Point Naval Shipyard (HPNS). The purpose of this description is to provide historical perspective with regard to shipyard and in-shop use of hazardous waste compounds. It also attempts to define waste volumes generated and past means of disposal. Other aspects of waste storage, transportation, processing and disposal locations are discussed in subsequent chapters.

5.1 INDUSTRIAL OPERATIONS.

5.1.1 Introduction. In the normal course of work by the various industrial shops at HPNS, industrial and hazardous wastes were generated and disposed of onsite. These wastes includes electroplating shop wastes, acids, alkalies, paint sludges, pickling wastes, oily wastes, and various other liquid and solid wastes associated with shipbuilding. In almost all cases these naval industrial operations began in 1944 and ceased in 1974 when the shipyard was disestablished. Some of these shipbuilding operations were leased by Triple A Machine Shop, Incorporated in 1976 and are currently in operation at the shipyard. Discussed below are some of the major generators of hazardous wastes listed by functional group. Table 5-1 lists all sources of hazardous wastes generated at the shipyard over the last 35 years. Figure 5-1 shows the location of all buildings at HPNS.

5.1.2. Structural Group (Shops 11, 26, 41, 17). The structural group was composed of four shops: Shipfitters (Shop 11), Welding (Shop 26), Sheetmetal (Shop 17), and Boilermaker (Shop 41). Of these the shipfitting shop generated the highest volumes of hazardous wastes. Shipfitting operations took place in Building 411. Naval shipfitting activities began in 1946 and ceased in 1975 when the property was leased to Triple A Machine Shop. Shipfitting operations included the rip out and removal of structural and underwater ship items and the fabrication and repair of ship's components. In an open yard area adjacent to Building 411, pickling of structural steel took place. Waste products from this operation were generated by the drainage of chemical and rinse water tanks. (See Table 5-1, Building 411 for a listing of waste volumes generated.) Up until 1975 all liquid wastes were discharged to the combined storm and sanitary sewer which in turn were pumped to the San Francisco treatment plant or occasionally were discharged directly into the Bay. Solid wastes composed of used ship components and empty chemical containers were disposed of at the industrial landfill site. Quantities of solid wastes generated by this group could not be determined.

5.1.3 Mechanical (Shops 06, 41, 31, 38, and 56). Mechanical operations took place mainly in Buildings 258, 134, 253 and 231. This group included:

- Central tool (Shop 06)
- Forge and Heat Treating (Shop 41)
- Inside Machining (Shop 31)
- Marine Machinery (Shop 38)
- Pipefitting (Shop 56)

Table 5-1

Industrial Sources and Quantities

Building No.	Description of Originating Process	Waste Quantities: Continuous Average Flow	Waste Quantities: Periodic Discharge	Waste Chemicals and Materials	Method of Disposal
258	Pipe Cleaning Shop -- draining of chemical tanks and rinse	2 gpm	6,000 gal. per week	Chemical Solution Tanks (1) Muriatic acid (2) Sodium hydroxide (3) Sulfuric acid (4) Chromic acid (5) Sodium hydroxide and Penesolve 814 (6) Penestrip CR	Combined sewer
				Other Chemicals Used Naconal powder, degreasing compound, Diesel oil	Landfill
411	Shipfitting Shop -- pickling of structural steel, draining of rinse water tanks and chemical tanks	----	15,000 gal. water rinse tank once per month. Each 15,000 gal. chemical tank 4 times per year.	Chemical Solution Tanks (1) sulfuric acid, sodium chloride, and inhibitor (2) Sodium dichromate and phosphoric acid	Combined sewer
411	Shipfitting Shop -- pickling of structural aluminum, draining of rinse water tanks and chemical tanks	3 gpm	7,500 gal. once per month	Chemical Solution Tanks (1) Wyandotte M.F. acid and Altrex cleaner (2) Wyandotte 2487 acid	Combined sewer
411	Shipfitting Shop -- sand blasting abrasive	1 gpm	190 tons/week	Spent blasting grit and sand containing paint, scrappings, rust (metal)	Bayfill Landfill
134	Inside Machining Shop -- cleaning of engine parts, draining of chemical tanks and rinse tank	1 gpm	----	Chemical Solution Tanks (1) Penesolve 814 (2) Penestrip CR	Combined sewer
123	Battery Overhaul -- discharge of electrolyte from batteries to be reconditioned, and washdown water	100 gpm during periods when electrolyte being discharged	----	"Used" electrolyte (sulfuric acid and distilled water), soda ash (for partial neutralization)	Storm sewer

Table 5-1

Industrial Sources and Quantities (Continued)

Building No.	Description of Originating Process	Waste Quantities: Continuous Average Flow	Waste Quantities: Periodic Discharge	Waste Chemicals and Materials	Method of Disposal
124	Acid Mixing Plant -- washdown of spilled acid, draining of acid tanks	----	1,000 gal. per month washdown water.	Sulfuric acid and distilled water (combined to form electrolyte for storage batteries)	Storn sewer
123	Plating Shop -- electroplating, paint stripping, irriditing, and parkerizing	20 gpm	----	<u>Cyanide Plating Solutions</u> Copper, cadmium and silver <u>Acidic Plating Solutions</u> Nickel, chrome, tin, lead, gold, and brass <u>Other Chemical Solutions</u> Penetol X, irridite, and Parko-composition <u>Acid Solutions</u> Chromic, nitric, sulfuric, phosphoric, fluoboric, and Muriatic Used containers and buckets	Storm sewer
111 and 112	Diesel Oil Pumping Plant -- draw-off from oil separator units, washdown of spillage	----	2,000 gal. per month	Emulsifying agent during washdown Waste oil	Oil reclamation plant, Storm sewer
270	Paint Shop -- cleaning paint buckets	100 gal. per day	3,000 gal. chemical solution tank 4 times per year	Sodium hydroxide Used paint buckets	Combined sewer
253 (1st floor)	Ordnance Shop -- cleaning, paint stripping, and painting of steel	2 gpm	3,000 gal. chemical solution tank 4 time per year	Sodium hydroxide, Stoddard solvent, Steam-Kleen, and various paints	Combined sewer
253 (2nd, 4th & 5th floors)	Electronic and Optical Shop -- cleaning, paint stripping and painting of aluminum and steel	2 gpm (total)	300 gal. chemical soultion tank once per month	Sodium hydroxide, Oakite aluminum cleaner 164, and various paints	Combined sewer
211	Machine and Electronic Test and Repair Shop -- paint stripping and painting	1/2 gpm	----	Sodium hdyroxide, D-Floate, Steam-Kleen compound, and various paints	Combined sewer

Table 5-1

Industrial Sources and Quantities (Continued)

Building No.	Description of Originating Process	Waste Quantities: Continuous Average Flow	Waste Quantities: Periodic Discharge	Waste Chemicals and Materials	Method of Disposal
271	Paint Shop -- spray painting	----	300 gal. once per week	D-Kleen, various paints	Landfill
217	Sheet Metal Shop -- spray painting	1 gpm	300 gal. twice per month	D-Floate, various paints	Landfill Combined sewer
280	Aluminum Cleaning Facility	1/2 gpm	5,000 gal. rinse tank once per month. Trisodium tank once per week. Wyandotte tank once every 6 mo.	Chemical Solution Tanks (1) Sodium phosphate tribasic (2) Wyandotte 2787 deoxidizer (No neutralization)	Combined sewer
---	Oil Reclamation Plant -- gravity separation in open ponds	14,000 gal. per day	1,000,000 gal/year	Fuels Reclaimed Bunker Oil, Lube Oil, and Diesel Oil Chemical Used Dunkit (degreaser) Slix (oil emulsifier) Gamlen (oil emulsifier) Clock 06:39 (oil emulsifier)	Reclaimed oily wastewater to Bay
272	Riggers Shop -- cleaning of chain hoists	100 gal. per day	----	Steam-Kleen	Combined sewer
351	Electronics Shop -- cleaning and painting electronic equipment	1 gpm	----	Chem-mist detergent, very small quantities of alcohol and trichloroethylene	Combined sewer
351	Electronics Shop -- photographic reproduction and photo developing	30 gpm	200 gal. per week from chemical solution trays	Ammonium thiosulfate, silver, salts, acetic acid, sodium sulfite, sodium carbonate, and minute quantities of cyanides. Also various chemicals washed off print paper	Combined sewer

Table 5-1

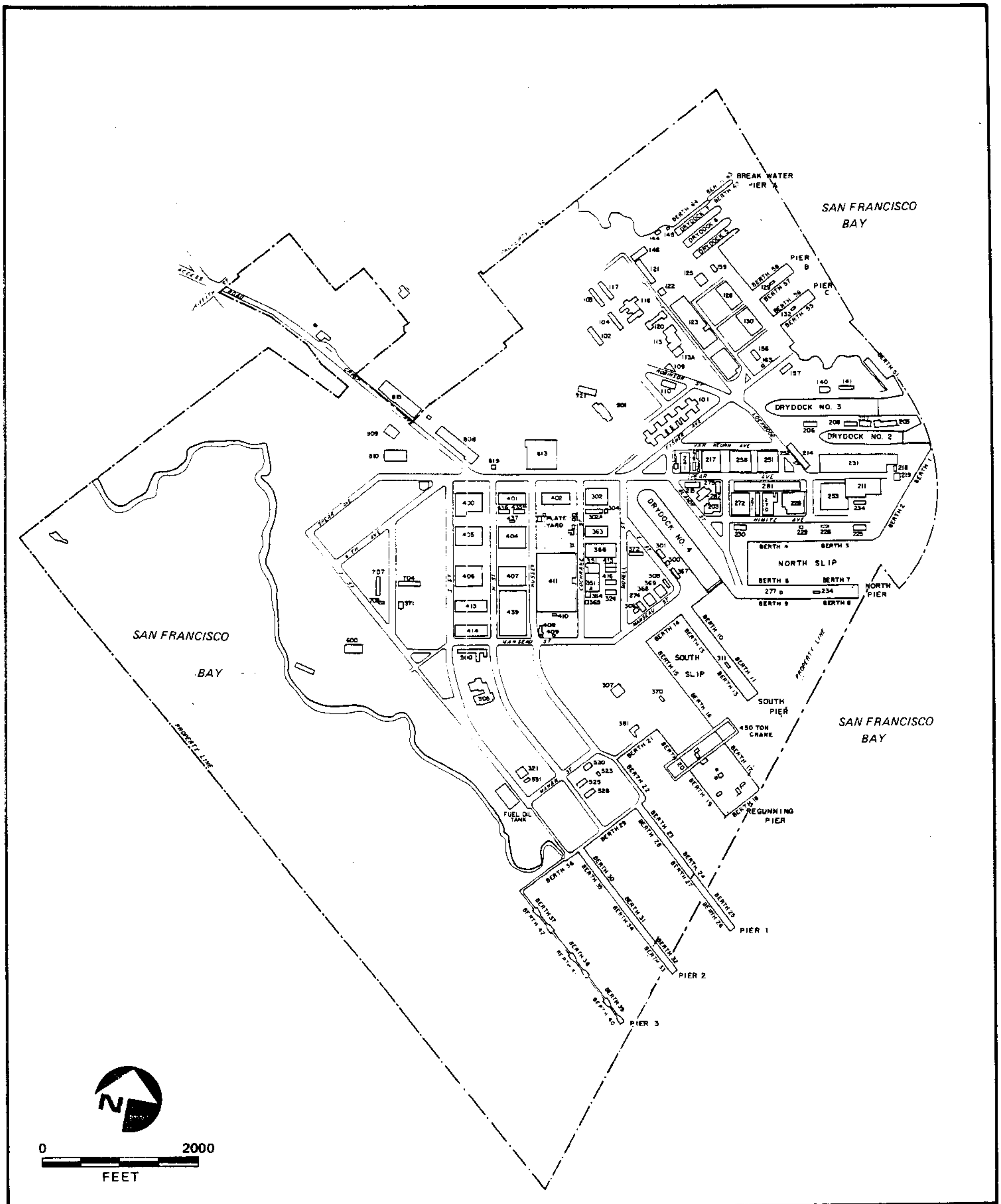
Industrial Sources and Quantities (Continued)

Building No.	Description of Originating Process	Waste Quantities: Continuous Average Flow	Waste Quantities: Periodic Discharge	Waste Chemicals and Materials	Method of Disposal
351A	Electronics Shop -- cleaning of electronic equipment	100 gal. per day	----	Chem-mist detergent small amounts of thinner and solvent	Combined sewer
232	Electronics Repair Shop -- no cleaning facilities	----	100 lbs. used parts/day	Electronic parts, wiring, radium dials	Landfill
366	Boat Shop -- painting and washing	100 gal.	300 gal. once per	Epoxides, polyester resin, methylethylketones	Combined sewer
215	Fire House -- washing of apparatus	300 gal. per day	----	Detergent	Combined sewer
530	Hobby Shop -- car washing	300 gal. per day	----	Detergent	Combined sewer
113	Salvage Divers Shop -- no cleaning facilities	----	1,000 lbs/week	Waste metal equipments	Scrap yard, Landfill
435	Equipment Storage Bldg. -- spray painting	200 gal. per day	300 gal. once per per week	Various paints, paint thinner	Combined sewer
436	Material Storage Bldg. -- washing garbage cans	2 gpm	500 gal. twice per year	Sodium hydroxide, detergent	Combined sewer
302	Transportation Shop -- cleaning transportation equipment	1 gpm	----	Decarbonizer, degreaser, and detergent	Combined sewer
101	Reproduction Department -- blueprint, ozalid, and photo developing (small amount)	25 gpm	500 gal. per week from solution trays, etc.	Hydrogen peroxide, ammonia, photodeveloper solutions and various chemicals washed off print paper	Combined sewer
231	Machine Shop -- cleaning facility	2 gpm	5,000 gal. rinse water once per week. 3,000 gal. chemical solution once per month	<u>Chemical Solution Tanks</u> (1) sulfuric Acid - 1 (2) Phosphoric Acid - 1 (3) Sodium Hydroxide - 3 (4) Dichord Benzene - 2	Combined sewer
203	Power Plant -- boiler blowdown and backwash from zeolite water softeners	5,000 gal. per month	1,500 gal. 10 times per month backwash	Softeners -- dilute sulfuric acid, salt solution	Combined sewer

Table 5-1

Industrial Sources and Quantities (Continued)

Building No.	Description of Originating Process	Waste Quantities: Continuous Average Flow	Periodic Discharge	Waste Chemicals and Materials	Method of Disposal
231	Machine Shop -- backwash from water demineralization plant, and boiler blowdown	2,000 gal. per month	3,000 gal. 4 times per month (anion softeners). 1,500 gal. 7 times per month (cation softeners).	Anion softeners -- caustic solution Cation softeners -- sulfuric acid solution	Combined sewer
			1,000 lbs solid, metal waste per month	Metal, scrap equipment	Landfill



INITIAL ASSESSMENT STUDY
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Location of Buildings at HPNS

FIGURE 5-1

A listing of the chemical and solid wastes generated at these shops and buildings is provided in Table 5-1. Shop 31 in Building 134 provided services of repairing and manufacturing parts for heavy tools, valves, and pumps. Industrial wastes were generated from metal cleaning and test boiler cleaning. Caustic solutions and rinse water were discharged to the storm sewers on the average of 1 gallon per minute (gpm). Shop 56, Pipefitting, in Building 258 generated chemical and acid solutions at a rate of 6000 gallons per week. Chemicals included muriatic acids, sodium hydroxide, sulfuric acids, chromic acid and penesolve and penestrip cleaners/solvents. In all cases the wastes were discharged to the combined sewer system. Solid wastes at all mechanical shops included chemical and solvent containers, waste oils, metals, wood, plastics and rags. Solid wastes were hauled to the industrial landfill site at a rate of 1 ton per month.

5.1.4 Electrical (Shops 51, and 67). Electrical operations took place in Buildings 123, 124, 211, 253 and 351. This group of primarily electrical operations included:

- Weapons, mechanical, and electronics overhaul
- Electrical Instruments Repair
- Battery Overhaul and Storage
- Radar and Communication Repair

Of these shops, the Battery Overhaul (Shop 51) in Building 123 generated the most significant amounts of hazardous waste. It has been estimated that 100 gpm of used electrolyte was discharged over the 30 year life of this shop. Used electrolyte is composed of sulfuric acid, water and soda ash. All liquid waste streams from Building 123 were discharged directly into the Bay. Table 5-1 lists the wastes, volumes and methods of disposal for all electrical shops.

5.1.5 Service Shop Group. The Service Shop group consists of a wide variety of auxiliary services to the ships and the other production shops. These include shipwright services, small boat repair and maintenance, plastic parts manufacture (Shop 64), waterfront and shop painting and abrasive blasting (Shop 71), rigging, equipment cleaning, and pumping (Shop 72), pipefitting (Shop 56), and ship support services (Shop 99). Work operations of these shops are scattered throughout the waterfront area and shipyard.

Painting and abrasive blasting services are provided to the ships and production shops by Shop 71. The abrasive blasters prepare metal surfaces for painting by removing old paint, rust, barnacles and by smoothing uneven surfaces. These finished surfaces are then coated by the painters who provide three types of service: dry dock painting, top and deck painting, and booth-shop painting. Dry dock painters specialize in shiphull painting; top and deck painters paint the exterior of the ship other than the hull; booth-shop painters provide painting services for ship and shop components that are more conveniently done in spray booths.

The abrasive blasters were divided at HPNS into two work centers for both shop and waterfront metal surface blasting. Large scale abrasive blasting operations performed on the ships was done at Drydock 2, 3 and 4. A maximum of ten (10) blasters were used at each drydock.

The composition of abrasive materials is mostly aggregrate sand (80 percent) with some copper slag, steel grit, and glass beads. Spent (used) abrasive was hauled to the Bay fill area on the south shore of the shipyard or to the industrial landfill site on the west end of the shipyard. Spent abrasive contains rust, paint scrapings and barnacles, which increases its volume by 18 percent. HPNS used 12,200 tons of abrasive sand per year resulting on 14,400 tons of waste sand and scrapings. During the 33 years of sandblasting operations of HPNS (1942-1974) it has been calculated that 475,000 tons of abrasive waste was generated containing 85,500 tons of non-sand scraping material. It is estimated that 52,300 tons of this waste consisted of paint scrapings.

5.2 ORDNANCE OPERATIONS. In the Twelfth Naval District, the loading and discharging of cargo ammunition and high explosive items of ships allowances is performed only at designated Naval ordnance facilities. Ships scheduled to undergo repair or overhaul at HPNS were all relieved of their ammunition and explosives, except for permissible small arms ammunition before entry into waters near the shipyard. Two facilities at HPNS were designed as explosive storage structures: a Small Arms Magazine located near Building 813 and an Explosive Storage Magazine located near the shoreline on the southeast side of HPNS. However, the Small Arms Magazine was not used for its as-built function. The Explosive Storage Magazine was used to store small arms and some explosives. There was no indication that storage or handling of explosives took place anywhere else on the shipyard. Additionally, only small quantities of ordnance were handled. Consequently, no hazardous wastes were generated at HPNS because of ordnance operations.

5.3 RADIOLOGICAL OPERATIONS. From 1950 to 1969, HPNS supported a series of radiological defense laboratory research projects which were designed to protect personnel and properties against nuclear weapons. Broadly defined, these projects encompassed chemistry (studied decay, properties of fallout), biology (studied fallout effects on animals), and physics (studied instrumentation, shielding). A list of buildings where these types of projects were conducted is provided in Table 5-2.

During the 1950s all radiological projects at HPNS were under the review of a Navy health physicist. All buildings where radiological research was undertaken were periodically surveyed for contamination and any contamination found was cleaned and all wastes were placed into 55-gallon drums. These drums were temporarily stored in a fenced, controlled, and monitored area at HPNS. These barrels were periodically transported on a barge, taken out to sea (to the Farallon Islands) and released into the ocean. All barrels were encased with concrete and sunk to a depth of 1000 fathoms. In the early 1950s waste radioactive material was also received onsite at HPNS from the University of California at Berkeley and Lawrence Livermore Laboratories. It was trucked to Berth 15, temporarily stored in 55-gallon barrels and disposed of by barge to the Farallon Islands as were the waste barrels generated at HPNS. In total, an estimated 150 barrels of radioactive wastes were handled, temporarily stored, and transported off the shipyard property each year from 1950 through 1959.

In 1955, the Radiological Defense Laboratory in Buildings 815 and 816 were completed. All liquid waste products generated in Buildings 815 and 816 were held in a tank and monitored to determine if the effluent met standards for radioactivity prior to release into the sewerage system. If standards were not

Table 5-2

Areas Where Radioactive Wastes Were Generated at HPNS

Building	Radiological Research Operations	Years in Operations
364	Chemistry	1951-1969
506	Radiochemistry	1951-1955
507	Biological Lab	1951-1955
508	Health Physics Office	1951-1955
509	Biological	1951-1955
510	Physics	1951-1955
815	Chemistry, Biology, Physics	1955-1969

*Radioactive waste types generated by the above buildings could not be identified by the IAS.

met, the liquid was hauled off shipyard property by a licensed contractor. From 1960 to 1969 all liquid and solid radioactive wastes were picked up by a licensed contractor. These were then hauled off shipyard property to an approved Atomic Energy Commission landfill. Some of these wastes were stored in Building 364, others were stored at Area 707.

In 1969 all radioactivity studies ceased at HPNS. All radioactive sources and wastes were removed including the pavement in Area 707. In 1969 and again in 1979 and 1980 a thorough decontamination of Buildings 364, 815, and 816 was made. (Radioactive decontamination was conducted twice (1969 and 1979) because AEC/NRC standards changed between those years, requiring a second examination.) All waste material was hauled off shipyard property, with the exception of the concrete sump behind Building 364 which was filled with concrete. In 1975, a monitoring study of all radiological areas of HPNS was conducted by a health physicist under the direction of the Atomic Energy Commission. No radiological contamination was found at HPNS and the AEC concluded that the past radiological areas can be reused for any public or private operations without restrictions.

From 1945 to 1970 ships undergoing overhaul generated radioactive wastes in the form of luminescent radium dials. As these dials were removed from the ships, the most common means of disposal was to the industrial landfill. These ships were either in berths or drydocks. An estimated 6000 pounds of dials and knobs were disposed of over a 25-year period at the HPNS landfill site.

CHAPTER 6. MATERIALS HANDLING, STORAGE AND TRANSPORTATION

This chapter describes past hazardous waste handling, storage and transportation operations and facilities at Hunters Point Naval Shipyard (HPNS).

6.1 INDUSTRIAL WASTES.

6.1.1 Industrial Operations. Solid waste materials generated by the industrial shops at HPNS can be broadly segregated into the following categories as they relate to the source and method of handling:

- Ships garbage and waste
- Shop wastes
- Salvageable scrap
- Household/domestic refuse

Between 1945 and 1948 domestic garbage from Navy housing was collected and transported to a small disposal area (Site 2) on the southeastern corner of the shipyard. Collection was at that time a HPNS public works responsibility.

During the years 1942 to 1959 most HPNS wastes were, however, collected by a private contractor who transported the material to an offsite disposal area. A landfill in Brisbane, California was commonly used by the contractor. In 1959 the shipyard began to dispose of solid waste in a bay landfill site (Site 3) on the west end of the shipyard. The filling of bay lands with solid waste continued until 1974. Solid wastes continued to be hauled off to the shipyard landfill site by a private contractor. An estimated 100 Dempster Dumpmaster steel containers were collected and emptied twice weekly at the shipyard. In addition, an estimated 200 55-gallon trash containers were emptied and hauled off to the landfill every week. Truck trips for the transportation of wastes to the landfill averaged 40 trips per day. A discussion of the types of industrial wastes generated by each shop is found in Chapter 5. It has been estimated that about 130,000 cubic yards or 10,000 tons of solid waste material was collected and disposed of (either on or off the shipyard) each year at HPNS.

Liquid wastes from shops were disposed of in the combined sanitary and storm sewer system. A discussion of these wastes sources can be found in Chapters 5 and 7. Oily wastes generated by ships and shops were transported either by pipeline or by 55-gallon drums in trucks to an oil reclamation pond system located on the south shore of HPNS.

6.1.2 Scrap Yard Operations. The shipyard scrap yard (Site 5) has been in operation since the 1940s and is currently operating in the same location (see Figure 2-1). Scrap delivered to this location was generally waste material having commercial value as metal but no longer useable for the originally intended purpose. Materials stored there included used battery lead and copper, scrap steel, ship parts and electrical capacitors. Since 1974, there has been no more use of the scrap yard to handle lead and copper from sub batteries or electronics from ships. Lead, copper, and PCBs (from broken capacitors) have been identified as potential contaminants at this site. Scrap was delivered by shipyard public works trucks and transported offsite usually by rail or truck.

6.1.3 Transformer Storage Yard. From 1946 to 1974 used electrical tranformers of various sizes were stored in an open yard 400 feet north of Building 704 (see Figure 2-1). The transformers were taken off of ships or from places in the yard by the electrical shop, trucked to the storage yard where they were stored for indefinite periods of time. The yard was maintained by public works. Transformers were periodically hauled offsite by a private contractor where they were sold as scrap or recycled. Transformers were stored at this site over a 28-year period.

6.1.4 Surplus Materials (Salvage Yard) Operations. Salvage or surplus materials are those materials that can be reused for their originally intended purpose. If material could not be used for this purpose it was disposed of as scrap material (see Section 6.1.2). Therefore, any discharge of hazardous wastes or liquids at this site was accidental and due to spills or leaks.

The location of the salvage yard at HPNS is just south of the scrap yard site. The salvage yard operated from 1942 to 1974 under the Navy. The yard is currently used for the same purpose by Triple A Machine Shop. The source of salvage was almost entirely from ships in for repairs.

6.1.5 Above-Ground and Buried Storage Tanks. Between 1942 and 1974 there were approximately 43 above-ground and buried oil storage tanks at HPNS. About 13 tanks have been removed since 1975. A list of tanks, their type, capacity, location and contents is provided in Table 6-1. Those tanks which have been removed are also included in this table.

The above-ground storage tank farm near Buildings 111 and 112 is currently being used by Triple A. Reportedly, in the early 1940s, one of the 286-barrel diesel tanks ruptured and its contents overflowed the tank farm berm area. The spill was cleaned up. No records exist of other past spills or of leaking tanks, either buried or above ground.

6.2 ORDNANCE OPERATIONS. In the Twelfth Naval District, the loading and discharging of cargo ammunition and high explosive items of ships allowances is performed only at designated Naval ordnance facilities or explosive anchorages. Ships scheduled to undergo repair or overhaul at Hunters Point are all relieved of their ammunition and explosives, except for permissible small arms ammunition, before entry into the waters near the shipyard.

Prior to 1974, two facilities at Hunters Point were designated as explosive storage structures: a Small Arms Magazine located near Building 813 and an Explosive Storage Magazine located near the shoreline on the southeast side of the activity. However, the Small Arms Magazine is not used for its as-built function and the Explosive Storage Magazine was demolished. No explosive storage facilities are currently required for the activity.

6.3 RADIOLOGICAL OPERATIONS. A number of radiological research projects were conducted at HPNS. These projects studied the decontamination of ships and the chemical, physical and biological aspects of the consequences of radioactive fallout. All radioactivity studies were conducted and monitored under the close scrutiny of a health physicist. Radioactive wastes on the shipyard were containerized in 55-gallon drums, encased with concrete and sent to a depth of 500 to 1000 fathoms approximately 50 miles from HPNS in the Pacific Ocean.

Table 6-1

Above-Ground and Buried Storage Tanks

Structure No.	Type of Tank**	Capacity Gal.	Capacity BBls.	Location	Department	Contents
S-117	Steel Up.	184,150	4,384	Near Bg. 112	Supply & Prod.	Diesel Oil
S-118	Steel Up.	12,000	285.7	Near Bg. 112	Supply & Prod.	Diesel Oil
S-119	Steel Up.	12,000	285.7	Near Bg. 112	Supply & Prod.	Diesel Oil
S-120	Steel Up.	12,000	285.7	Near Bg. 112	Supply & Prod.	Diesel Oil
S-121	Steel Up.	12,000	285.7	Near Bg. 112	Supply & Prod.	Diesel Oil
S-122	Steel Up.	12,000	285.7	Near Bg. 112	Supply & Prod.	Diesel Oil
S-123	Steel Up.	12,000	285.7	Near Bg. 112	Supply & Prod.	Diesel Oil
S-124	Steel Up.	12,000	285.7	Near Bg. 112	Supply & Prod.	
S-125	Steel Up.	12,000	285.7	Near Bg. 112	Supply & Prod.	
S-126	Steel Up.	12,000	285.7	Near Bg. 112	Supply & Prod.	Lube Oil
*S-127	Steel Horiz.	3,000	71.4	Near Bg. 111	Supply & Prod.	Lube Oil
*S-128	Steel Horiz.	3,000	71.4	Near Bg. 111	Supply & Prod.	Lube Oil
*S-129	Steel Horiz.	3,000	71.4	Near Bg. 111	Supply & Prod.	Lube Oil
*S-130	Steel Horiz.	3,000	71.4	Near Bg. 111	Supply & Prod.	Lube Oil
*S-131	Steel Horiz.	3,000	71.4	Near Bg. 111	Supply & Prod.	Lube Oil
*S-132	Steel Horiz.	3,000	71.4	Near Bg. 111	Supply & Prod.	Lube Oil
*S-133	Steel Horiz.	3,000	71.4	Near Bg. 111	Supply & Prod.	Lube Oil
*S-134	Steel Horiz.	3,000	71.4	Near Bg. 111	Supply & Prod.	Lube Oil
S-135	Steel U.G.	1,250	25.7	Near Bg. 116	Supply & Prod.	Fuel Oil
S-136	Steel U.G.	750	17.9	Near Bg. 118	Supply & Prod.	Fuel Oil
*S-146	Wood Up.	7,500	178.0	Near Bg. 124	Public Works	Sulphuric Acid
*S-147	Wood Up.	5,000	119.5	Near Bg. 124	Supply & Prod.	Distilled Water
*S-148	Wood Up.	5,000	119.5	Near Bg. 124	Supply & Prod.	Distilled Water
*S-149	Wood Up.	5,000	119.5	Near Bg. 124	Supply & Prod.	Electrolyte
*S-150	Wood Up.	5,000	119.5	Near Bg. 124	Supply & Prod.	Electrolyte
S-209	Conc. U.G.	210,000	5,000	Near Bg. 203	Public Works	Fuel Oil
S-211	Steel U.G.	3,000	72	Near Bg. 203	Public Works	Fuel Oil
S-212	Steel U.G.	4,500	107	Near Bg. 203	Public Works	Fuel Oil

Table-6-1

Above-Ground and Buried Storage Tanks (Continued)

Structure No.	Type of Tank**	Capacity Gal.	Capacity BBls.	Location	Department	Contents
S-213	Conc. U.G.	35,000	834	Near Bg. 203	Public Works	Treated Water
S-214	Steel U.G.	21,924	522	Near Bg. 205	Public Works	Fuel Oil
S-215	Steel U.G.	25,320	602.9	Near Bg. 270	Supply & Prod.	Paint Thinner
S-304	Steel U.G.	6,880	163.8	Near Bg. 304	Public Works	Gasoline
S-305	Steel Up.	6,880	163.8	Near Bg. 304	Public Works	Gasoline
S-505	Steel Up.	630,000	15,000	Near Bg. 521	Public Works	Fuel Oil
S-506	Steel Horiz.	21,000	500	Near Bg. 500	Public Works	Gasoline
S-508	Steel U.G.	750	17.9	Near Bg. 500	Supply & Prod.	Fuel Oil
S-711	Steel U.G.	5,000	11.9	Near Bg. 709	Ships Service	Gasoline
S-712	Steel U.G.	5,000	11.9	Near Bg. 709	Ships Service	Gasoline
S-713	Steel U.G.	5,000	11.9	Near Bg. 709	Ships Service	Gasoline
S-714	Steel U.G.	5,000	11.9	Near Bg. 709	Ships Service	Diesel Oil
S-801	Steel U.G.	10,800	257	Near Bg. 811	Supply & Prod.	Diesel Oil
S-802	Steel U.G.	6,800	164	Near Bg. 811	Supply & Prod.	Fresh Water
S-901	Steel Up.	420,000	10,000	Innes Ave.	Public Works	Fresh Water
S-453	Unknown U.G.	Unknown	Unknown	Near Bg. 435	Public Works	Unknown
S-454	Unknown U.G.	Unknown	Unknown	Near Bg. 435	Public Works	Unknown

*Tanks have been removed

**Up. = Vertical
Horiz. = Horizontal
U.G. = Underground

Approximately 150 drums a year were disposed of in this manner from 1950 through 1959.

Ocean disposal of radiological waste ceased in 1959 and between 1960 and 1969 HPNS radioactive wastes were hauled offsite by contractors to licensed disposal sites. From 1960 through 1969, the health physicist continued to monitor all radioactive activities. In 1969 all radiological research activities ceased at HPNS.

CHAPTER 7. WASTE PROCESSING

This chapter discusses the various waste processing or treatment operations at Hunters Point Naval Shipyard (HPNS).

7.1 INDUSTRIAL. No industrial waste processing took place at HPNS. No sewage treatment or industrial waste treatment plant ever existed there; however, an oil reclamation plant and a small incinerator were utilized.

7.1.1 Sanitary and Storm Sewers. From 1941 to 1977 a combined sanitary and storm sewer carried the sanitary, industrial, and storm waste waters to Building 819 where pumps sent it to the City and County of San Francisco's treatment plant. No processing of the water was accomplished on base. During this time period occasional large storms would result in the combined sewer system overflowing thus causing flow diversion to outfalls in San Francisco Bay. In 1977 a military construction project separated the two sewer systems, and stopped this diversion problem.

7.1.2 Waste Oil Reclamation. HPNS operated a waste oil reclamation system utilizing two man-made ponds and a boiler on the southeast shoreline (Site 1). One pond was 50 x 60 x 5 feet with a capacity of 3500 barrels and one was 55 x 100 x 5 feet with a capacity of 4500 barrels. The ponds were unlined and constructed in Bay-fill material within 10 m of Bay waters. They were constructed in 1944 and were in use until 1974 when they were filled in and the surface structures removed.

Oily wastes from ships and yard operations were brought to the ponds via tank truck from various places in the yard and by 8 inch pipeline from Berth 29. In addition, oily wastes were barged to Hunters Point from other government installations such as Alameda and Treasure Island for reclamation. The annual amount of waste received at the ponds varied from about 0.6 to 2.0 million gallons with as much as 30 percent coming from other installations. The oily waste was primarily from tank cleaning and ballast and bilge pumping for ships undergoing repair. In addition slop oil generated in the yard such as lube oil, gear oil, and hydraulic fluid, was collected and sent to the ponds. At the ponds the oil was heated to assist in oil water separation and drawnoff water was discharged to the Bay. Reclaimed oil was then removed from the ponds about three times a year by a contractor who sold much of it for road oil. Evidence suggests that the ponds were influenced by tides and that oil leached to the Bay at times.

7.1.3 Incineration. A small incinerator behind Building 815 was in use from the mid 1950s to 1970. It was used to destroy classified documents primarily generated in those buildings where radiological research was being conducted such as in 815, 364, and 506, and 816.

7.2 ORDNANCE. No ordnance processing systems were on HPNS property. All ordnance handling connected with Navy vessels was accomplished outside HPNS boundaries in other parts of San Francisco Bay.

7.3 RADIOLOGICAL OPERATIONS. No processing of radioactive wastes was conducted on HPNS property.

CHAPTER 8. DISPOSAL SITES AND POTENTIALLY CONTAMINATED AREAS

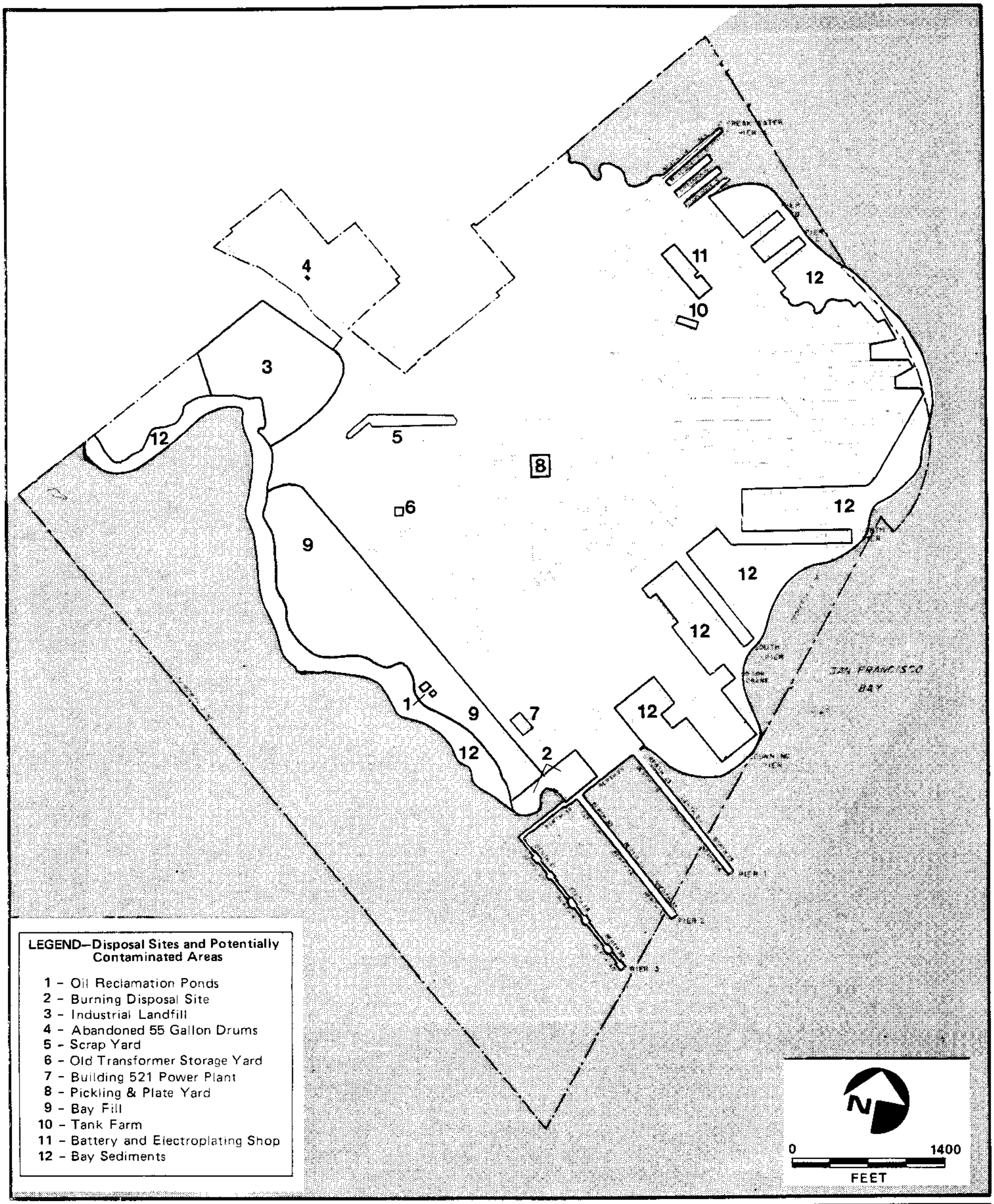
This chapter describes the disposal sites and potentially contaminated areas identified by the IAS team at Hunters Point Naval Shipyard (HPNS). Figure 8-1 shows the location of all HPNS disposal sites.

8.1 SITE 1, OIL RECLAMATION PONDS. From 1944 until 1974, HPNS operated a waste oil reclamation system utilizing two man-made ponds and a boiler on the southeast shoreline of the shipyard. One pond was 50 x 60 feet wide x 5 feet deep with a capacity of 190,000 gallons and the other was 55 x 100 x 5 feet with a capacity of 250,000 gallons. The ponds were unlined and constructed in bay fill material within 10 meters of bay shoreline. In 1974 the ponds were filled in with bay fill material and the surface structures removed. There was no indication that any clean-up operation of underlying soil materials took place prior to the ponds being filled in.

The ponds received oily wastes from ships in dry dock or berth and from shipyard shop operations. The oily wastes were transported to the ponds either by tank truck or by an 8-inch pipeline from Berth 29. In addition, oily wastes were barged to Hunters Point for reclamation from other government installations in the Bay Area such as Alameda and Treasure Island. The amount of waste reclaimed at the ponds varied from about 0.6 to 2.0 million gallons a year with as much as 30 percent coming from other installations in the Bay Area. Reclaimed oil was removed from the ponds on the average of three times a year by a contractor who transported the oil off base and sold it for road oil. The waste oils and fuels were primarily from ships' fuel tank cleaning and ballast and bilge pumping for ships undergoing repair. In addition slop oil generated in the yard such as lube oil, gear oil, and hydraulic fluid, was collected and sent to the ponds. Evidence suggests that some of the oily waste was contaminated with chemicals such as solvents (trichloroethylene), caustic soda, ethylene glycol and chromates. The IAS team could not determine the amount of chemicals that were disposed of in the ponds. The waste oil was heated to assist in oil-water separation and draw-off water was discharged to the Bay.

Oils are expected to have percolated into the bay fill material and to the ground water system. The migration pathway is towards the Bay and being that the ponds were 10 meters from the shore, the potential is high that oily waste contaminants are entering the Bay via the ground water systems.

8.2 SITE 2, BURNING DISPOSAL SITE. In the southeastern corner of the shipyard an open burning refuse disposal site was operated from 1945 to 1948. The site was approximately 1 acre and was used for the disposal of general refuse and domestic garbage from the Navy housing quarters. No reports were recorded of hazardous material or liquid waste disposal at this site. The volumes of waste received have been estimated at 30 tons per day. Over the 3 years of operation approximately 23,000 tons of wastes were disposed of at the site. Burning was done on a regular basis which substantially reduced the volume of solid waste. The operation ceased when odor and smoke began to impact the Navy housing units nearby by site. The site was graded and covered at its closing in 1948. The site is not suspected of containing hazardous waste materials or other contaminants, and therefore the potential for migration of contaminants would not exist.



INITIAL ASSESSMENT STUDY HPNS, SAN FRANCISCO	Disposal Site Location Map	FIGURE 8-1

8.3 SITE 3, INDUSTRIAL LANDFILL. From 1958 to 1974 the south Bay shore area of the shipyard was used as an industrial landfill site. Records show that little control was placed on the disposal of both solid and liquid chemical materials at the site. The solid wastes included domestic garbage and refuse, bay dredge materials, building construction and demolition materials, industrial shop waste, waste containers, and low-level radioactive waste. The solid waste was generated by all shipyard operations and shops including the disposal of ship repair materials. It is estimated that approximately one million cubic yards of solid waste material were deposited in the landfill.

Various known chemical and industrial liquid wastes were also disposed of in the landfill. The types of liquid waste are described in a study conducted by Kennedy Engineers (1967) and are summarized on Table 5-1 of this report. According to Kennedy (1967), some of the industrial liquid waste generated was disposed of in the landfill. The report also showed amounts of waste generated. It was assumed by the IAS team that the waste disposed of in the landfill is about 0.5 percent of the industrial waste volumes shown in Table 5-1, Chapter 5. Table 8-1 reflects the use of this assumption, which shows the volumes of liquid wastes disposed of in Site 3.

Table 8-1

Quantities of Liquid Wastes
Placed In The Industrial Landfill

Bldg. No. Where Waste Was Generated	Type of Waste	Estimated Total Quantity (minimum gallons 1958-74)
134	Penesolve 814 Penestrip CR	2,000
253	NaOH, Stoddard solvent Stan Kleen, and paints	4,000
	Paint sludges	4,000
211	Paint sludges	1,000
271	Paint sludges	1,000
217	Paint sludges	1,000
435	Paints and paint sludges	2,000
302	Waste solvents, oils, greases	2,000
231	Solvents and waste oils	4,000

Prior to 1960, the paint and paint sludge wastes contained lead. The bulk wastes also include asbestos from ships and buildings. It is estimated that 500 cubic yards of asbestos were disposed in the landfill. In addition, it is estimated that 6000 pounds of fluorescent radium dials and knobs from ships were placed in the landfill.

According to a HPNS sand blasting handling report, approximately 14,000 tons of sand and scrapings from blasting were generated each year. This amounts to 475,000 tons of waste sand for the approximate 33 years (1945-1978) when land-filling and bay filling were the methods of disposal. It is approximated that this material contained about 52,000 tons of paint scrappings. It is assumed that half of this material is deposited into the Bay Fill area east of the landfill (Site 9), and the other half is deposited in the industrial landfill (Site 3).

In late 1974, the landfill was closed by implementing Military Construction (MILCON) Project 262. The project included a storm water interceptor line that directs storm water runoff from the hill area north of the landfill. This prevents the runoff from inundating the old landfill and increasing leachate problems. The storm water is diverted around to an outfall near Berth 36. MILCON 262 also included covering the fill area and planting of native grasses. In addition, an earthen dike 1000 feet long of impervious clay was constructed along the bay front. This dike was supposed to include a slurry trench excavated below the water level. However, reports indicate the excavation was very difficult due to the large amount of bulky debris underground and an effective seal was not possible to construct.

Site 3 is located on fill and is adjacent to the Bay. The hazardous waste includes large volumes of liquids as shown in Table 8-1. Therefore, the potential for contamination to leach into the soil and ground water is high. In addition, the potential for these contaminants to migrate towards the Bay is also high.

8.4 SITE 4, ABANDONED 55-GALLON DRUMS. Seven abandoned 55-gallon drums are located just to the west of Building 816. One of the drums is labeled Styrene and one Pine Tar. The other five drums are unlabeled. All drums were partially full and showed evidence of leaking. The spill area is about 200 square feet. The drums were originally placed at the site in 1977.

The drums are located over an area consisting of a thin veneer of fill which overlies bedrock. However, the volume of the spill area is very small and distance to the Bay is almost 1 mile. Therefore, the potential migration of contaminants from this spill area towards the Bay is minimal. Due to the unknown nature of the drum contents, a potential threat to human health may exist if direct human contact with the spill area were to occur.

8.5 SITE 5, SCRAP YARD. The scrap yard is located just east of the industrial landfill site, in the southwest portion of HPNS. The yard has been in use since 1954. The area is mostly unpaved but may have been oiled to surpress dust.

Besides bulk material such as shipyard steel, materials such as capacitors, lead, and copper were also stored at this site. It is estimated that more than 1000 capacitors were stored over the 30 years. Many of the capacitors held

1-quart of PCBs each. This would amount to about 250 gallons of PCBs stored over 30 years. There is some evidence, from interviews, that these capacitors were crushed in the scrap yard against a concrete wall and at other scrap yard locations. If this occurred, PCB has been spilled around the scrap yard area.

The lead and copper were products from submarine batteries. It is estimated that over 42 million pounds of lead and about 7 million pounds of copper were stored at the scrap yard over the 30 years. Since the yard is exposed to rain it has been estimated that about 7000 pounds of lead and copper residue may have been washed onto the soil. This area is also bay fill material and therefore, contaminants can easily percolate into the ground water system. Migration towards the Bay is highly probable.

8.6 SITE 6, OLD TRANSFORMER STORAGE YARD. From 1946 to 1974 used electrical transformers of various sizes were stored in a open yard 400 feet north of Building 704. The site was and still is unpaved. The number of transformers stored or the length of time each was stored at this site could not be determined from records or interviews. However, current (1983) records show an average of six to eight used transformers containing PCBs have been stored at HPNS each year. Transformers are periodically hauled offsite by a contractor. Although there is no record of past transformer PCB oil spills, it can be assumed that some old transformers did leak oils and/or were emptied onsite. The possibility of PCBs being contained in the oils is high. The small amounts of spilled PCB would probably be absorbed in the soil. The mobility of PCB in the soil is very low and therefore it is unlikely that PCBs would enter the ground water system. PCBs on the surface soil would, however, present a potential threat to human health, if persons were to come into direct contact with the contaminated soil.

8.7 SITE 7, BUILDING 521 - POWER PLANT. Building 521 is located on the northeast side of J Street at Mahan St. The plant operated from 1950 to 1969 and has been shutdown since that time. Currently the site contains 400-500 lbs of discarded and waste asbestos, 15 unnamed, full 5-gallon chemical containers, and one 5-gallon can of xylene stored on the ground immediately outside of the building. Over the years asbestos has been washed by rains onto the surrounding unpaved soil.

As there is no visible evidence of leaking containers or spilled chemicals and the only major contaminant is asbestos particulates, the potential for ground water contamination of this site is small and migration to the Bay is unlikely.

8.8 SITE 8, PICKLING AND PLATE YARD. The steel pickling yard is located at Building 411 (Shop 11 and 7). Pickling occurred here from 1947 to 1973. Acid storage tanks, open (brick-lined) pits for dipping of large steel plates, and open plate yard storage racks characterize this site. Chemicals used at this site were zinc chromate primer, sulfuric acids, sodium dichromate, and resin thinners. Although this IAS could not determine the amount of chemicals spilled onto the paved surface, visual inspection of the site shows significant amounts of primer residue and acid stains on the equipment, buildings and ground. Untreated liquid wastes (acids) which were discharged to the storm sewer which flowed directly into the Bay. Estimated volumes of chemicals used and discharged into storm drains is provided in Section 5.1, Table 5-1. Volumes of chemicals spilled onsite could not be determined from records, interviews or site investigation.

In the past most of the liquid hazardous materials and wastes were either stored in lined pits or discharged to the Bay. Today, the yard is paved and surface runoff drains into a sewer system. These conditions prevent plate yard contaminants from reaching the ground water or the Bay. The overall potential for these contaminants to migrate to the ground water or Bay is small. A threat to human health may, however, exist for those coming in contact with the chemical residues left onsite.

8.9 SITE 9, BAY FILL. The area southwest of J Street is a large fill area of about 40 acres that was the disposal site for ship sandblast waste and other fill material from the mid 1940s to about 1978. Sandblasting sand as it is used can accumulate rust, paint scrapings, barnacles and other debris from the object (ship) being sandblasted which increases the sand volume by about 18 percent. Records indicate that about 10,000 tons of sand blasting abrasives were used annually in the shipyard. It was estimated that this volume of waste sand blast contained about 2200 tons of paint, rust and scraping material. These materials would be expected to contain lead, tin, chromium, zinc and other chemicals that were constituents of the paint scrapings. Over 33 years at HPNS, 85,500 tons of non-sand waste including 52,300 tons of paint scrapings were generated. It is assumed that 50 percent of this waste went to the Bay Fill area (Site 9) and 50 percent went to the industrial landfill (Site 3). Also, the shoreline of Site 9 has been rip rapped with steel cable and other metal debris at various points along the shore and especially at the southeastern edge of the site near Berth 36.

As there are high volumes of contaminants (paint scrapings, lead, chromium, etc.) present in the bay fill, the probability for contaminants to enter the ground water system and to migrate to the Bay is high. Surface water runoff, containing these contaminants, would also easily flow into the Bay.

8.10 SITE 10, TANK FARM. In the northern part of the yard is a small tank farm near buildings 111 and 112. There is currently one 4384 barrel (gallon/barrel) steel tank and nine 286-barrel steel tanks all being used to hold diesel oil except one of the 286-barrel tank which stores lube oil. Also at the tank farm site is an area from which eight 71-barrel steel horizontal tanks have been removed. The tank farm was built in the early 1940s and as described above is partially still being used and is partially past practice. Reportedly, in the early 1940s there was a major spill of diesel oil caused by a ruptured tank. Apparently the entire contents of a 286-barrel tank were spilled and it overflowed the berm. Cleanup consisted of removing the spilled oil to the oil reclamation ponds. In the area where the horizontal tanks were removed there is visable evidence of past leakage of an undetermined amount.

This site is underlain by bedrock. The hydraulic conductivity of the bedrock is generally quite low unless there are major fractures underlying a particular site. As the contaminants were cleaned up and because of the low hydraulic conductivity the potential for migration to ground water is low.

8.11 SITE 11, BATTERY AND ELECTROPLATING SHOP. From 1946 to 1974, waste acids contaminated with lead and copper were spilled onto the floor of the submarine battery shop in Building 123. In the 28 years of operation approximately 1.8 million gallons of spent acid was drained into floor drains. A total of about 40 million pounds of lead (battery elements) was also handled over the life of this operation. It was estimated that a total of 10,000 gallons of acid contaminated with lead spilled onto the floor and dock loading area of Building 123.

Most of these contaminants were spilled into floor drains which entered the storm sewer and discharged to the Bay. As the building has a concrete floor there is very little potential for the migration of these contaminants to the ground water. However, contaminant deposits may still be embedded on the floor of the building. Contaminated suspended particulates from the floor could pose a potential health threat to the workers that currently occupy this building.

A plating shop was also located in Building 123. Acids, chromates, and heavy metals from this operation were discharged primarily through the storm sewer system to the Bay. Cyanide wastes were also generated but were disposed of separately in containers and transported to the landfill. Approximately 250,000 gallons of spent electrolyte contaminated with heavy metals were poured into the floor drains. Approximately 1500 gallons of this contaminated electrolyte ended up on the floor itself. Some of these hazardous metals may still be deposited on the floor of the buildings and when agitated, could become particulates in the air posing an occupational health threat to workers occupying this building. There is no potential for ground water contamination from this site.

8.12 SITE 12, BAY SEDIMENTS. From 1942 to 1977 the shipyard had a combined sanitary and storm sewer system. Industrial waste water was discharged to this system and was pumped to the City and County of San Francisco's sewage collection system and treatment plant. However, in periods of high storm water runoff which occurred about 9-12 times annually, diversion structures would direct the flow directly to the Bay. Overflows were discharged near Berth 4, near Lockwood and Donohue Streets, near Berth 15, and southwest of Mahan and J Streets. In addition, from 1942 to about 1970 the battery and electroplating shop (Building 123) and the acid mixing plant (Building 124) discharged industrial waste water directly to the Bay via storm drain at an area near Berth 64. This drain carried about 12,000 gallons per day of wastewater to the Bay and contained sulfuric acid, solvents, hexavalent chromium, cyanide, copper, and lead from plating and battery overhaul operations.

In consideration of the extensive past discharges of industrial wastes to the Bay, the Bay sediment immediately surrounding HPNS is considered to be a past disposal site as it received both the soluble and insoluble contaminants in the waste stream. The soluble portion was diluted and carried away by tidal forces. However, insoluble metals and particulate wastes settled into the bottom sediment of the Bay. Sediment samples taken in 1971 to support a shipyard dredging permit application show elevated chemical oxygen demand (53,000-74,000 mg/gm), lead (46-65 mg/kg), volatile solids (71,000-90,000 mg/kg), and zinc (140-200 mg/kg). Sediment chemistry data from a 1971 analysis of shipyard bay sediment (next to the Dry docks) also show high copper levels of 1754 mg/kg. A 48 hour sediment bioassay conducted in 1971 did not show significant mortality to fish, however (Permit for Maintenance Dredging, WESDIVNAVFACENGCOM Memo to U.S. Corps of Engineers, 11 November 1971). Contaminants in the sediment are tightly bound and thus are not mobile unless the sediment is disturbed.

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APPENDIX A

GOVERNMENT AGENCIES CONTACTED FOR THE INITIAL ASSESSMENT STUDY AT HUNTERS POINT NAVAL SHIPYARD (DISESTABLISHED)

- Naval Energy and Environmental Support Activity (NAVENENVSA), Port Hueneme, California
- NAVFACENGCOM Command Historian, Naval Construction Battalion Center, Port Hueneme, California
- Naval Facilities Engineering Command (NAVFACENGCOM) Headquarters, Alexandria, Virginia
- Naval Facilities Engineering Command, Western Division, San Bruno, California: Planning Branch, Geotechnical Branch, Facilities Planning Department, Real Estate Branch, and Natural Resources Management Branch.
- Ordnance Environmental Support Office, Naval Ordnance Station, Indian Head, Maryland
- Department of Defense Explosive Safety Board, Alexandria, Virginia
- Navy Historical Center, Operations Archives, Navy Yard, Washington, D.C.
- Naval Library, Navy Yard, Washington, D.C.
- National Archives: Navy and Old Army Branch, Still Pictures Branch, and Cartographic Branch, Washington, D.C.; Federal Records Center and Suitland, Maryland and Laguna Niguel, California
- United States Environmental Protection Agency, Region IX, San Francisco, California
- City of San Francisco, Department of Water Resources, San Francisco, California
- Regional Water Quality Control Board, Oakland, California
- Supervisor of Shipbuilding, Conversion and Repair, USN, San Francisco.